Notes – Russian and former Soviet Union [FSU] Discharge Data

Six data sets were contrasted and ultimately synthesized into a single set:

1. RUS — the main set of 26 files (series A*nn* & E*nn*) in the Russian-US exchange data set posted at NCAR. [http://www.scd.ucar.edu/dss/datasets/ds553.0.html]
2. X-file — the composite of the 3 extra files (rwmo, rivdat1, rivdat2) available with the Russian-US exchange data set at NCAR.
3. UN72 — the 84 FSU sites in the old UNESCO/IHD data set with discharges to 1972 [available at NCAR from the ds552 page]
4. WMO — the 87 FSU sites in the NCAR data set ds552 attributed to WMO [http://www.scd.ucar.edu/dss/datasets/ds552.0.html]
5. RIV — the 85 FSU sites in the RIVDIS data set from ORNL [http://www-eosdis.ornl.gov/daacpages/rivdis.html]
6. O-file — a set of 25 FSU sites passed along by anonymous donor ***O***, 23 identical to WMO with almost perfectly concordant data on common months [including the same replication errors & typos] but some sites having having longer records as in RUS; plus 2 other Russian sites with 1985–87 data.

- GRDC site catalogue [http://www.bafg.de/html/internat/grdc/welcome_grdc.html] was used for cross comparing river & gauge names, geo coordinates, and drainage areas. GRDC information is often no more reliable than other sources.

- geographic locations and site coordinates were checked and derived as available in the ***Times World Atlas*** and the ***Digital Chart of the World*** [DCW] gazetteer,but many gauge sites have no entries so coordinates remain as given.

FSU–Russian Basin & Stream Gauge Coding System

- Rus-Am exchange data are identified by the FSU basin/gauge coding system numbers
- the system is summarized as best as can be ascertained from available info in Appendix A
- the available catalogues gave gauge codes for more sites than had data
- FSU gauge code nos. were available for all but 4 of the sites in other data files; hence, the FSU codes were adapted for the merged data set
- the FSU republics may have adapted other systems since independence

RUS [Russia_American exchange] data set

The main Russian Exchange data set comprised 26 files in the Ann & Enn series that nominally correspond to Asian and European drainage divisions within the Russian Federation. These had a total of 280 geographically unique site records. These were compiled into a joint working set dubbed ***RUS***.

Three extra files — rivdat1, rivdat2 & rwmo — had 38 unique site records. These were compiled into a set dubbed ***X-file*** or simply ***X*** and compared against RUS.

After reduction/collation of records under non-unique gauge codes, the total set contained records for 289 unique gauges.

All but a few of the 290 sites are in the Russian Federation. The 3 non-Russian sites I've identified are:

Code		River	Gauge	Lat	Lon	Country	
19072	w	Ural	Kushum	50.84	51.23	KZ	AS
19195	w	Ilek	Aktyubinsk	50.27	57.23	KZ	AS
80131	w	Desna	Chernigov	51.49	31.33	UR	EU

These are national border area sites. There may be a more non-Russian sites. My Soviet era digital map is coarse & lacks the political boundaries of the 15 now independent FSU republics.

In the early stages of processing, several issues concerning un-named records, and identical records under multiple site Ids were resolved:

- records 70085 and 70801 in X were found to be versions of the same gauge record [Severnaya Dvina at Ust Pinega]. These were extracted and handled separately with site record 70801 from RUS, before merging with RUS.

- records ***1492 unknown*** in RUS & ***1594 Amguema @ mouth of Shoumny Bk*** in X were identical on common months [1944-75]. The catalogue ID 1594 was retained for the collated record and the shorter 1492 record was deleted

- records ***10251 Tom @ Tomsk*** and ***10252 un-named*** are evidently identical. 10251 has records to 1980, while 10252 has records for 1981-85. On the common months, WMO site Tom @ Tomsk has records that are identical to these up to 1984 hence, in the Rus-Am files, the 1981-85 records for site 10252 were re-coded to site 10251 which was used as the sole code for Tom @ Tomsk

- record ***12434 Sosva @ Sosva*** was identified in available catalogues with drainage area 65,200 km^2. That drainage area belongs to the Severnaya Sosva [see below] ***not this site***. The 12000-12999 Russian basin codes are tribs of the Tobal trib of the Irtysh [Ob]. A town Sosva on a trib of the Tavada trib of the Tobal roughly at 59N, 62E (east of the Urals & due N of Yekaterinburg) is taken as the probable

location. My available maps give the river no name but the drainage area above Sosva is about right for annual discharge volume of record 12434. ***The drainage area has been listed as unknown in my catalogue.***

Pseudo FSU–Russian Gauge IDs

- For three sites in WMO & one in O-file not in the other sets, there were no FSU-Russian gauge nos. available. Hence, gauge numbers were faked using the appropriate basin code with suffix 999.

1999	w	Anadyr	Novy Eropol	RS	AS
75999	o	Volga	Yeltsy	RS	EU
84999	w	Kara Samur	Luchek	RS	EU
85999	w	Vorotan	Vorotan (1973-75 Urut)	AD	EU

Assignment of Unknown Sites

11 site records in the combined Rus-Am set had no directly corresponding names in the available catalogues. All but 2 were matched to catalogue sites as follows:

- ungeoreferenced record **3065 Tutura @ Grekhova** was assigned rough location coordinates at 54.86N, 105.40E which plot not far upstream of where the Tutura joins the Lena

- un-named record ***5105*** matches WMO record ***Ussuri @ Kirovsky*** at approximately the same coordinates

- Record 10127 spanning 1959-1985 has no catalogue entry, but site coordinates — 51º 24'N, 83º 35'E — are identical to those of catalogue entry 10134 Charysh @ Charyshskoye (Charyshsky in Rus-Am catalogue, Charyshskoye on most maps), an Ob R trib with no discharge records available but a reported area of 20,700 km^2 and a record spanning 1948-1985. The site correlates most strongly with Ob R @ Barnaul (downstream), and Ulba R @ Ulba Perevalochnaya (over the divide in the Irtysh basin). Charyshskoye is about mid way between Barnaul and Ulba Perevalochnaya. Thus record ***10127*** has been assumed to be ***Charysh R @ Charyshskoye*** with drainage area 20,700 km^2

- the basin code puts record **71193** on the Kola Peninsula and the given coordinates locate it just south of Umbo (variably Umb, Umba) Lake; hence, **Umbo @ Umbo Lake outlet** from Slack's list is the probable gauge name.

- Un-named record **75241** had coordinates that put it 17.6 km from the town of Buy in the probable location of gauge **Kostroma @ Buy d/s Veksa** listed by Slack without coordinates. At the listed drainage area (8,870 km^2), the specific runoff for record 75241 (243 mm/a) almost perfectly matches that of its nearest neighbours.

- Record ***76566 un-named*** at 57º 10'N, 50º 00'E is tentatively identified as catalogue entry ***Vyatka @ Akutkol'*** with area 96,900 km^2 based on unit runoff, 1939-85 period of record & the numbering sequence of 4 other Vyatka R (a Volga trib) sites in the catalogue. Judging from correlations & discharge magnitudes, Vyatka is almost surely the correct river. Vyatka @ Akutkol' is named in Slack's site list with no Russian gauge code. The location name *Akutkol'* may be wrong — Akutkol' is also given as location of gauge 13005 on Kara Turgai River of central Asia [found in WMO data set].

- un-named, un-georeferenced record **78142** is almost surely catalogue entry **Khoper @ Novokhopersk** based on the numbering sequence of Khoper gauges, intersite correlations, discharge magnitude & specific runoff

- un-named, un-georeferenced record **78011** is almost surely a Don R gauge. According to expected unit runoff (100–110 mm/a) the expected drainage area would be 75,000–82,000 km^2 for the given mean annual discharge. By eye-ball estimate, I judged the gauge location to be somewhere between Pavlovsk town [50.42N 40.14E] and Liski [51.00N, 39.50E] up river. The site could be a bit further upstream, but it almost surely has to be downstream of the junction of the Voronezh. For the time being, I've labelled the site ***Don R @ near Pavlovsk (likely)***.

- un-named record **72458** has coordinates that put it on the Lovat between Uzkoye (72450, drainage area only 398 km^2) and Kholm (72459 no records available, area 14,700 km^2). Local specific runoff would peg the 72458 drainage area at 7,500–8,900 km^2 with mean estimate of 7,850 km^2. The site correlates best with Velikaya and Sorot gauges from the adjacent watershed to the west. The available site lists give no other sites on the Lovat, but the given coordinates, probable drainage area and gauge number suggest it's likely a Lovat R site. For the time being, I've labelled it ***Lovat (tentative) @ unknown***. Neither the Times Atlas nor DCW has any towns in the vicinity of the given coordinates.

- un-named record **75348** has coordinates that put it 10 km from Bolkhov. The Slack list has an un-georeferenced gauge called Nugr @ Bolkhov with area 1,010 km^2. At the prevailing regional specific runoff (139–165 mm/a), the probable area of the catchment would be 930–1,100 km^2. Thus it seems likely that Nugr @ Bolkhov are the stream and gauge names. I've labelled record 75348 as **Nugr (likely) @ Bolkhov.**

- un-named, un-georeferenced record **76229** might be the Usva R @ Usva on the Slack list with area 2,170 km^2 and period of record 1932-85. The record correlates most strongly with record 76089 Vishera @ Ryabinino [northeasternmost corner of

the Volga basin], and 12517 Lobva @ Lobva [just over the Urals in the Ob basin], but the correlations aren't as strong as they could be [on de-seasonalized records]. The runoff of the Vishera [505 mm/a] contrasts sharply to available regional streams [200–300 mm/a], but the latter are at relatively low altitudes, while the Vishera drains the west flank of the Urals where precip may be higher than the 500–600 mm/a prevalent over the lowlands. The Urals peak at 1,400–1,500 m in this area. The Usva likewise drains off the west flank of the Urals from similar altitudes. If runoff is similarly about 500 mm/a, the drainage area would support the discharge produced at site 76229. Record 76229 also extends from 1932-85. Thus, ***I've labelled record 76229 as Usva R (tentative) @ Usva (tentative) with coordinates 58.73N, 57.70E from Times Atlas.***

Finally, 2 sites remain un-named or un-located:

3411	-99.00	-999.00	unknown	unknown	RS	AS	-9
76355	-99.00	-999.00	Urshak	Lyakhovo	RS	EU	3130

- record 3411 is a small (50–500 km^2) catchment somewhere in the vastness of north central / northeastern Siberia.

- record 76355 has to be northwest of Ufa, in the proximity of sites 76490, 76500, 76512; but the stream and the gauging point (Lyakhovo) are too small to show on any maps I have.

UN72, WMO and RIV

- Nominally UN72 has data for 84 FSU sites with discharges through 1972.
- WMO has data for 87 FSU sites with discharges to 1985.
- RIV has data for 85 FSU sites with discharges to 1985.

- data in RIV are the FSU subset of RIVDIS which is a compilation of data provided to UNESCO/WMO by Vorosmarti & associates

- data in WMO are nominally the same data that appear in RIV except that the compilation has been attributed to GRDC

- UN72 is an early compilation, nominally of 84 of the 87 sites in WMO. Despite it's age, UN72 was helpful for identifying some typos, mislabelled gauges, incorrect geographic coordinates & other discrepancies in the other data sets.

- The combined set has 87 geographically unique site records as summarized below. 61 sites are common to the Russia-US exchange files, while 26 sites are not. 25 sites are in FSU republics. Of these, 22 are not in the Russia-US exchange files.

Country	WMO	Rus-Am
Russia	62	59
Kazakhstan	10	2
Ukraine	3	1
Azerbaijan	3	
Tajikistan	2	
Belarus	1	
Moldova	1	
Estonia	1	
Lithuania	1	
Latvia	1	
Georgia	1	
Uzbekistan	1	
totals	87	62

As data in UN72, WMO & RIV ostensibly originated from the same submissions to UNESCO, data for common months should be identical among sets, but common data in the 3 sets differ somewhat due to scattered data entry errors, crude rounding in UN72, & other discrepancies.

RIV compilers incorrectly reduced the 4 independent site records listed below into two composite records.

RIV #	RUS #	River	Gauge		
1268	3811	Olenek	7.5 km d/s R Pur †	RS	AS
	3409	Olenek	8 km u/s R Pur	RS	AS
	85576	Vorotan	Eivazlar	AD	AS
228	85999	Vorotan	Vorotan (1973-75 Urut)	AD	AS

† identified as River Bur in some sources, definitey not to confused with the larger Pur River that drains to the Obskaya Gulf

12434 Severnaya Sosva @ Sosvinskaya Kultbaza

- the site identified in WMO as Severnaya Sosva @ Sosva in recent files, is correctly given in UN72 and RIV as Severnaya Sosva @ Sosvinskaya Kultbaza.

Volga — lower Volga sites

- Rus-Am data has 2 sites. WMO record has a copy of the Volgograd record, but it has the higher drainage area.
- Drainage areas may not be correct. Difference between the two sites seems to be too small.
- Discharge starts dropping below Volgograd as terrain becomes arid, local inflows decrease, & some waters may be diverted for irrigation.
- geo coords were also somewhat inconsistent

- as found

77090	48.67	44.50	1,350,000	Volga	Volgograd powerplant
wmo	48.77	44.72	1,360,000	Volga	Volgograd powerplant
77801	46.67	47.67	1,360,000	Volga	Verkhne-Lebyazh'ye

- after collating

77090 w	48.67	44.50	Volga	Volgograd powerplant	1,350,000
77801	46.67	47.67	Volga	Verkhne-Lebyazh'ye	1,360,000

Vorotan R sites

- 2 Azerbaijani sites were found in the WMO file — not in RUS data sets
- Eivazlar has ID 85576 in the Rus-Am site catalogues, while ID 85999 for Vorotan is a bogus ID devised for merging the site with Rus-Am data

85576 w	39.43	46.36	Vorotan	Eivazlar	2,000.0
85999 w	39.48	46.15	Vorotan - wmo	Vorotan (1973-75 Urut)	1,550.0

- in WMO, d/s site [Eivazlar] has 5 yrs record 65-69, and u/s site [Vorotan–Urut] has 69-84 data
- ***the common yr [69] has identical data at both sites***
- UN72 has Eivazlar with records for 1965-72 of which the 69–72 records are identical to the 69-72 records given for Vorotan-Urut in WMO

- I've interpreted somewhat arbitrarily that the UN72 data were correctly given for Eivazlar, and that the Vorotan-Urut record in WMO begins in 1973 rather than 1969
- I applied the WMO 1969-72 Vorotan-Urut data to Eivazlar in place of UN72 records as several months have 3 digit precision rather 2 in UN72.

Drainage Area Discrepancies

Nura @ Sergipal'skoye 13066

- area given as 17,960 sq km in RUS catalogue file
- site has data only in UNESCO & WMO files where area is given 12,300
- using 12,300 sq km

Ishym @ Petropavlovsk 11410

- old UNESCO file gives area as 106,000 sq km
- WMO & new RUS files give area as 118000 sq km

Ob @ Salekhard 11801

- old UNESCO file gives area as **2,430,000** sq km — this is widely used
- WMO, GRDC & new RUS files give area as **2,950,000** sq km
- a UNEP/SCOPE source gives total basin area as 2,550,000 sq km
- difference of up to 530,000 sq km is apparently due to inclusion/exclusion of closed drainage areas (some Ob/Irtysh tribs wrap around closed drainage areas) & likely also variable boundary definitions between Ob basin & closed drainage areas of central Asia (according to a Scope 91 source)

Norilka @ Valek 9455

- ***RUS drainage area of 19,800 km^2 is likely wrong***
- specific runoff using this area is too high (702 mm) as mean annual total precip at nearest gauges is ca. 350 mm & precip at Valek might average up to 500 mm if elevation is higher
- if geo coords are correct, true drainage area must be 40,000-50,000 km^2 to yielding of 275-345 mm

Alazeya @ Argakhtakh 3881

- ***RUS drainage area of 17,700 km^2 is likely wrong***
- this yields average annual runoff of only 55 mm, while typical regional values are 100–170 mm
- for available discharges, probable range of drainage area is 5,700–9,700 km^2, so true area might be 7,700 km^2 which would yield 126 mm runoff

Kalaus @ Svetlograd 84009 — Kalaus @ Petrovskoye

- UN72, WMO, GRDC & RUS have site record **84009 Kalaus @ Svetlograd**, while Slack's list gives un-georeferenced site **Kalaus @ Petrovskoye** with the drainage area of 4,540 km^2 —— these are likely the same entity

Kara Turgai @ Akutkol 13005

- UN72, WMO & GRDC give area as 14,700 sq km
- RUS gives area as 14,900 sq km
- using 14,900 sq km

Pyarnu @ Orekula 41127

- UN72, WMO & GRDC give area as 5,180 sq km
- RUS gives area as 5,150 sq km
- using 5,150 sq km

Plotnikova @ Dalny

- RUS area is 642 sq km
- WMO area is 649 sq km
- using 642 sq km

Nimelen @ Timchenko

- RUS area is 9950 sq km
- WMO area is missing
- using 9950 sq km

Onega @ Porog

- RUS area is 55,700 sq km
- WMO area is 55,770 sq km
- using 55,700 sq km

Luga @ Tolmachevo

- RUS area is 6,350 sq km
- WMO area is 5,990 sq km
- using 6,350 sq km

Oka @ Kaluga

- RUS area is 54,900 sq km
- WMO area is 349,000 sq km
- using 54,900 sq km

GEO coord Corrections

- geographic coordinates given for these sites are often somewhat rough
- sites having coordinates were checked against coordinates given in the Digital Chart of the World [DCW] gazetteer
- DCW coordinates were substituted for 127 sites & some of the DCW coordinates were modified slightly if DCW plotted perceptibly off river
- many of these substitutions were done blindly as my digital map has blue line coverage only for larger rivers. In my experience, DCW generally has <1% perceptible errors & most of those are small. Generally, DCW points at towns or airports not stream gauges, but for 85-90% of ca. 25 sites I checked manually, the DCW coordinates were better than the given coordinates which plotted perceptibly off river, at the wrong location on the river, or in some cases, on the wrong river altogether.
- for any work dependent on the precise geographic location of these gauges, the locations should be corroborated independently

- the most significant error was site ***11524 Konda R @ Bolchary*** for which coordinates given in file A11 [59.67N, 49.00E] put the site 1,000 km west into Russian basin 76000

- otherwise location changes were generally <100 km, mostly 5–30 km

- True location of record ***77336 Chagra @ (Novotulka ??)*** is uncertain. The Slack list and the Russian catalogue have a site Chagra at Novotulka with ID 77336. However, the only readily findable Novotulka is a town on the Maly Uzen in the Ural system (basin 19000). Basin 77000 indicates a lower Volga trib, and there is a small Volga trib called the Chagra that enters from the east below the Kuybyshev Reservoir that would seem to be the proper watershed. DCW has no Novotulka in that area; however, this doesn't preclude there being a fly-spec called Novotulka somewhere on the Chagra. However, record 77336 does not correlate well or even modestly with anything else in the set, so it's remains unclear if these data are properly labelled. For plotting purposes, I've assigned this record to coordinates ***52.708N, 48.500S*** in the lower Chagra.

- coordinates for site ***70158 Kichmen'ga @ Zakharovo ??*** are rough estimates; couldn't find Zakharovo, but given the drainage area & discharge volume, this site has to be near the confluence with the Yug

Data Discrepancies

- in riv1dat, the July 1950 entry at site 70850 was 345O which was assumed to be 3450 which is consistent with the typical July discharges observed at the site

- in the main file there were 2 completely identical copies of record 70180

Comparisons among Data Sets

- where possible discrepancies were evaluated by comparing RUS, X, and WMO/UN72/RIV
- X-file had data for 24 FSU [23 Russia, 1 Ukraine] sites in WMO/UN72/RIV

Discrepancies: non-WMO sites

- there were 229 sites that had not been reported in UN72/WMO/RIV
- only 8 of these had records in both RUS & X, and these records were essentially identical in RUS and X on common months
- standard outlier scanning techniques are limited by the nearly dichotomous nature of much of the Arctic & arid region data, i.e., zero discharge most years, perceptibly positive observations during warm/wet years
- consequently, potential outliers tagged by standard scanning were evaluated by inspecting the site records vis-à-vis records of nearest neighbours both geographic and as determined by intersite correlations (generally Spearman's ρ on both raw & de-seasonalized data). This isn't too hard to do if the correlation matrices have been pre-determined and the outlier scanning software is set up to dump records in a format convenient for visual inspection.

- the scans revealed some flagrant discrepancies shown below

- ***Some discrepancies were deleted, & some I left unchanged; you may want to revert to original data or sub in your own guess at the truth.***

Missing Values and Zeros

- sites in northeastern Siberia and southerly arid regions of central Asia may contain numerous zeros during the freeze up months or dry season respectively
- in the Rus data files, each record has a qualifier code that indicates amongst other things which data are to be interpreted as zeros rather than missing values.

- in the UN72/WMO/RIV files, many data that should have been interpreted as zeros, were reported as missing values
- the problem is most acute at ***1594 Amguema @ mouth of Shoumny Bk*** where most missing values reported in UN72/WMO/RIV sets are in fact zeros according to Rus files

- incorrectly interpreting missing values as zeros can have significant repercussions for (a) time series modelling, and (b) the estimation of specific runoff
- in the latter case, regardless of how calculations are performed, excluding the zeros and admitting only the positive discharges that occur during the occasional warm winters, can significantly overestimate the specific runoff for the watershed which in turn leads to overestimation of surface runoff regional water budgets & other extrapolations that are typically derived from specific runoff data

Documented Data Discrepancies:

1341 Sugoy R @ 3.2 km d/s Omchikhan

- several significant discrepancies in WMO/RIV relative to RUS which appears OK

1801 Kolyma @ Srednekolymsk

- in WMO & RIV, the 1981 record is replicated in 1982
- the RUS & x-file records appear legitimate

		RUS	x-file	WMO	RIV
1981	1	138.0	138.0	138.0	138.0
1981	2	120.0	120.0	120.0	120.0
1981	3	80.4	80.4	80.5	80.5
1981	4	95.3	95.3	95.5	95.5
1981	5	3,990.0	3,990.0	3,990.0	3,990.0
1981	6	5,710.0	5,710.0	5,710.0	5,710.0
1981	7	2,600.0	2,600.0	2,600.0	2,600.0
1981	8	3,650.0	3,650.0	3,650.0	3,650.0
1981	9	2,260.0	2,260.0	2,260.0	2,260.0
1981	10	1,360.0	1,360.0	1,360.0	1,360.0
1981	11	460.0	460.0	460.0	460.0
1981	12	238.0	238.0	238.0	238.0
1982	1	145.0	145.0	138.0	138.0
1982	2	104.0	104.0	120.0	120.0
1982	3	91.1	91.1	80.5	80.5
1982	4	78.2	78.2	95.5	95.5
1982	5	2,850.0	2,850.0	3,990.0	3,990.0
1982	6	7,470.0	7,470.0	5,710.0	5,710.0

1982	7	4,150.0	4,150.0	2,600.0	2,600.0
1982	8	4,130.0	4,130.0	3,650.0	3,650.0
1982	9	4,570.0	4,570.0	2,260.0	2,260.0
1982	10	864.0	864.0	1,360.0	1,360.0
1982	11	301.0	301.0	460.0	460.0
1982	12	327.0	327.0	238.0	238.0

- Through the 1940s & 1950s, WMO/UN72/RIV agree with RUS while there are numerous discrepancies between RUS & X
- From 1964 onward, X agrees with RUS while there are numerous discrepancies with WMO/UN72/RIV
- As reasons for the discrepancies are unclear, there is no particular reason for choosing the other records over RUS with the exception of some probable typos shown below
- ***the June 1928 discharge is the lowest of 56 years by 300-fold and was changed***
- the May 1951 RUS value is within the range of reported values and may be valid; this was left as is
- ***the May 1958 value would be the lowest ever by an order of magnitude and was changed***

			RUS	WMO	X-file	O-file	dif	seasonal	r1	r2	r3
1801	1928	6	10.2			10200.0	-10189.8	9732	-12	0.6	
1801	1951	5	265.0	2650.0	435.0		-2385.0	1981	-3.9	1.6	-3.5
1801	1958	5	10.9		109.0		-98.1	1799	-4.6		-4.4

3153 Peledui R @ Solezavod

- Jun 1938 discharge is probably a typo; 2nd lowest discharge in 30 yrs is 32
- site correlates only poorly with nearest neighbours (ca. 300 km removed)
- from pre-/post- months, expected Jun discharge would be 48–178
- I suspect true Jun 1938 discharge is 120, but I left this one unchanged

	J	F	M	A	M	J	J	A	S	O	N	D
1936	23.2	19.2	15.6	16.4	112.0	142.0	63.3	39.2	31.3	25.0	27.7	23.7
1937	21.6	19.0	16.3	16.0	304.0	81.5	31.4	40.4	41.5	31.2	25.8	17.9
1938	15.1	13.0	11.8	47.4	330.0	12.0	50.4	34.2	25.2	23.7	20.9	15.5
1939	13.5	12.1	12.2	38.0	104.0	36.0	26.9	17.1	16.4	9.9	9.3	10.9
1940	9.9	9.2	7.6	10.0	143.0	40.1	21.8	17.3	16.4	15.2	10.3	11.5

3180 Chara R @ Tokko

- Dec 1972 discharge (7.25) is too low; it would be 6-fold lower than the 2nd lowest Dec discharge in 52 years
- this site correlates well with ***3036 Lena @ Solyanka*** for which Dec discharge increases from Nov; but the latter is 10+ fold larger & not necessarily the best indicator
- at a comparably sized neighbour, ***3157 Bolshoi Patom @ Patoma,*** that correlates only moderately (Spearman ρ = 0.5), Dec discharge drops by half from Nov, the typical decline
- evidence is a bit weak, but this looks to me like a typo & I ***changed the Dec discharge to 72.5***
- you may want to change it back or delete it

	J	F	M	A	M	J	J	A	S	O	N	D
1970	56.9	38.8	39.3	68.5	1070	2730	1250	777	1180	347	125.0	84.8
1971	62.8	48.1	39.5	54.6	1280	2320	2100	1250	1670	441	151.0	94.6
1972	74.7	63.1	41.5	37.4	659	1930	953	831	1240	255	90.4	7.3
1973	59.2	48.6	40.7	47.0	810	1720	1480	998	380	270	102.0	93.8
1974	62.9	43.8	41.4	44.6	469	2630	1690	764	379	261	99.7	77.7

3222 Aldan R @ Ust-Mil'

- Apr 1971 discharge is a probable typo; downstream site 3225 had normal discharge
- ***Apr 1971 discharge was changed to 151*** which is about right vis-à-vis the other site

	J	F	M	A	M	J	J	A	S	O	N	D
1969	186	118	85	94.9	3910	12700	4800	1640	1970	717	294	250
1970	165	122	105	103	7270	14500	2320	2630	4000	1300	593	373
1971	256	188	137	1510	8340	6890	3630	3040	4330	1300	441	393
1972	243	193	151	195	5000	10000	8470	8970	5660	2700	491	353
1973	233	180	154	159	5070	6170	5320	7270	2130	1130	553	388

3291 Amga R @ Buyaga

- Apr 1967 discharge is extreme & likely a typo
- ***the WMO/UN72/RIV value of 88.0 was substituted***
- site 3291 correlates only modestly with its somewhat remote nearest neighbours (3222 at 341 km to the east, & 3180 at 403 km to the west); discharges at both rise modestly in Apr to levels well below the May peak)

	J	F	M	A	M	J	J	A	S	O	N	D
1965	19.7	18.8	15.3	16.4	539.0	286.0	101.0	44.9	93.3	44.9	29.8	18.2
1966	14.5	13.4	11.4	8.8	569.0	258.0	67.1	50.1	86.2	51.8	30.4	20.6
1967	15.8	14.9	12.5	887.0	857.0	254.0	36.7	40.4	38.0	34.9	16.8	15.9
1968	14.9	11.0	10.6	114.0	746.0	164.0	58.6	56.2	103.0	39.0	18.8	15.8
1969	12.7	8.2	6.7	4.5	484.0	438.0	195.0	33.4	37.3	21.1	15.7	10.4

- Apr 1943 discharge also stands out as extreme; but this may be a case similar to 1968 where the spring flood arrived early
- this was left unchanged

	J	F	M	A	M	J	J	A	S	O	N
1941	10.9	10.0	8.8	10.2	543.0	206.0	23.9	20.7	19.7	17.3	5.6
1942	8.5	8.2	8.4	9.3	388.0	230.0	43.4	86.2	126.0	81.3	35.3
1943	11.4	8.9	7.9	182.0	535.0	85.5	118.0	222.0	245.0	129.0	62.5
1944	19.1	15.3	14.2	15.0	845.0	190.0	227.0	237.0	154.0	92.9	37.2
1945	17.0	15.2	14.6	16.3	673.0	306.0	216.0	53.8	63.7	42.5	24.5

3367 Markha R @ Malykai

- there are 10 or so discrepancies between RUS and the others; the only one of these that seems likely to be a typo occurs in both RUS & WMO
- the RUS Aug 1988 value would tie the lowest Aug discharge reported for 42 yrs
- this was left unchanged, but you might want to consider the X-file discharge

			RUS	WMO	X	diff	Seasonal	r1	r2	r3
3367	1984	8	13.3	13.5	133.0	-119.7	281.1	-4.8	-4.8	-2.6

3409 & 3811— Olenek River Sites

- There are 2 gauge records for the lower Olenek River.
- RUS has record 3409 which extends from July 1951 to Dec 1963.
- X has record 3811 which extends from 1964–87.

Rus #	UN72 #	RIV #	River	Gauge	Drainage area
3409	MH31		Olenek	8 km u/s R Pur	181000
3811		1268	Olenek	7.5 km d/s R Pur	198000

- UN72 incorrectly gave a composite of record 3409 and 3811 for 1952–72 identified as being site 3409
- WMO correctly gave record 3409 for 1952–63 and 3811 for 1965–84.
- RIV incorrectly gave the same composite for 1952–84 as UN72, but identified the site 3811

- comparison of record 3409 from RUS & WMO shows only trivial rounding inconsistencies

- comparison of record 3811 from X & WMO shows numerous discrepancies mainly over 1965–69 with a few in 1979. Several of these are significant in percentage terms, but modest in magnitude as they don't occur on peak discharges.

- Despite it's uncertain pedigree, it seems reasonable to assume that the X-file record for 3811 is the better choice for the time being.

3821 Lena R @ Kusur

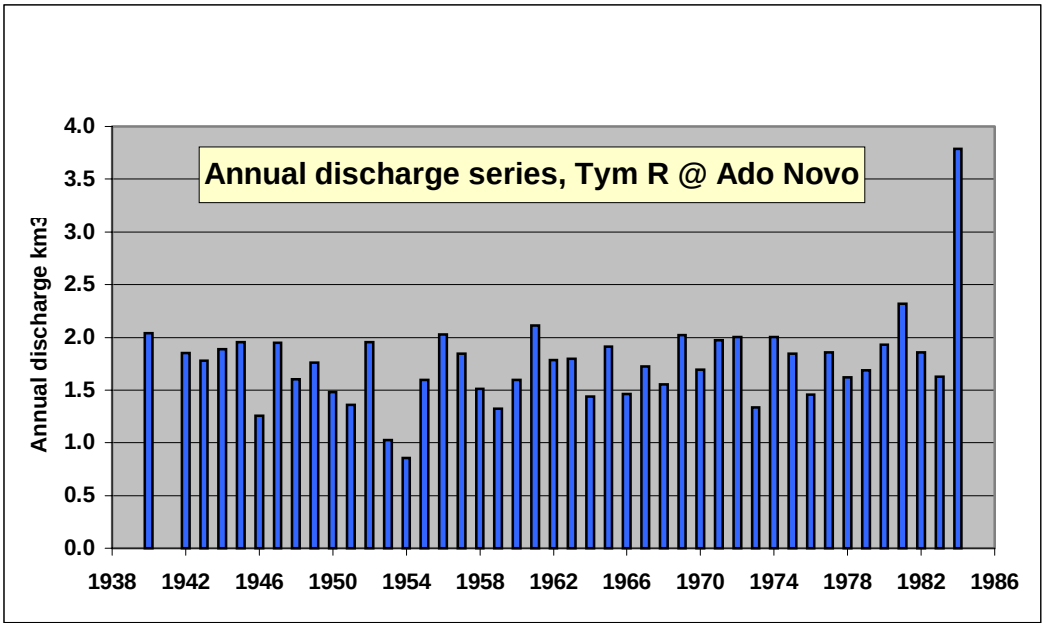
- RUS & WMO/UN72/RIV agree except for a few typos in the latter
- Oct–Dec 1974 RUS discharges may be in error

			RUS	WMO	diff	Seasonal	r1	r1
3821	1974	7	52000	52000		39481	6.1	6.1
3821	1974	8	38300	38300		27291	8.0	8.0
3821	1974	9	23200	23200		24683	-1.0	-1.0
3821	1974	10	16700	13600	3100	13811	3.3	-0.2
3821	1974	11	6190	4050	2140	3280	15.5	4.1
3821	1974	12	4820	2990	1830	2740	14.9	1.8
3821	1975	1	2360	2360		2600	-1.9	-1.9
3821	1975	2	2010	2010		1975	0.3	0.3
3821	1975	3	1600	1600		1425	2.0	2.0

4033 Tym R @ Ado Tymovo

- 1984 discharges [last available year] are extraordinarily high
- this is the only Sakhalin Island stream in the set, so there's nothing to compare it to
- the plot of the annual discharge series confirms that 1984 data are highly abnormal
- analysis of data for 4 coastal precip gauges surrounding site 4033 which is in the centre of the island shows that 1984 was consistently near or below long term mean rainfall at each precip gauge
- ***thus, I've deleted 1984***

	J	F	M	A	M	J	J	A	S	O	N
1979	10.3	10.0	10.5	19.2	178.0	60.2	28.3	65.5	154.0	55.0	25.9
1980	13.6	11.6	11.0	13.1	273.0	184.0	25.9	14.5	59.2	75.7	28.0
1981	14.0	11.0	9.4	31.0	222.0	70.0	34.0	51.5	82.0	237.0	82.5
1982	18.5	15.0	13.0	43.5	207.0	159.0	40.5	17.0	28.5	92.5	42.0
1983	16.0	12.5	10.5	45.5	188.0	130.0	26.0	29.5	30.5	74.5	30.0
1984	80.0	89.0	92.0	101.0	245.0	136.0	99.0	107.0	94.0	143.0	120.0



7024 Barguzin R @ Barguzin

- Jul–Dec 1971 discharges are up to 10-fold too low; Jul-Dec discharges at 3 regional sites (3096, 7072, 7098) which correlate only modestly with site 7024, all have normal Jul-Dec discharges
- ***Jul-Dec 1971 discharges are implausibly low, so I deleted them***
- it is possible that the river was damned for 6 months, but ostensibly it drains an area of mostly national park/nature preserve so that explanation doesn't seem likely

- May 1972 discharge is extremely low; the 2nd lowest May discharge in 51 yrs is 77
- At the 3 neighbours, May 1972 was also abnormally low, and at 2 of these, the lowest May discharges on record over virtually identical time frames; however the extrema were 70–80% of the previous recorded low
- May 1972 was likely the lowest May discharge on record at site 7024, so I left this unchanged
- nonethelss, it's much less certain that May 72 discharge fell all the way to 12.1 m3/s; 40–50 m^3/s seems to be the plausible range

	J	F	M	A	M	J	J	A	S	O	N	D
1969	33.2	27.2	22.0	42.0	144.0	243.0	169.0	223.0	207.0	85.5	48.5	41.8
1970	33.6	28.0	24.6	51.2	141.0	282.0	331.0	200.0	169.0	101.0	48.0	34.5
1971	27.3	24.5	20.9	56.3	155.0	250.0	9.8	8.9	5.5	3.7	2.8	1.8
1972	39.2	29.4	28.7	63.4	12.1	135.0	200.0	203.0	103.0	70.1	42.7	39.6
1973	35.5	28.4	23.6	40.3	158.6	287.0	360.0	653.0	359.0	137.0	58.6	49.2
1974	42.9	35.4	20.5	58.5	101.0	334.0	201.0	161.0	110.0	95.8	46.1	32.8

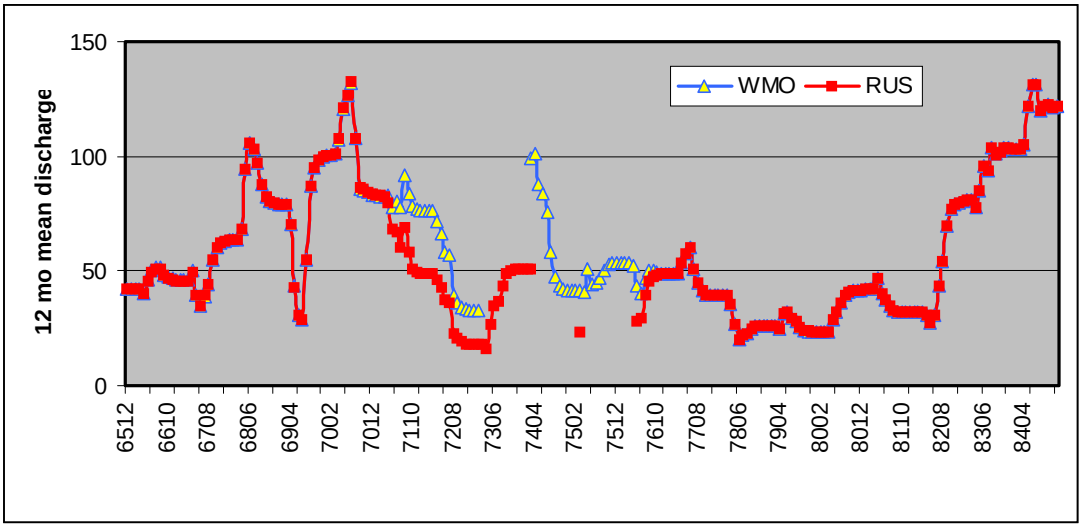
7047 Selenga R @ Novoselenginsk

- Dec 1950 discharge is a probable typo; this would be the highest Dec discharge in 54 yrs record by two fold
- correlations with Russian neighbours are only modest, but Russian sites show no December rise, so any rise in discharge at site 7047 would have to have originated upstream in Mongolia
- based on the historical Dec record and other Russian sites, the Dec 1950 discharge at site 7047 should be <170 and >92.8
- as the precise value isn't obvious, ***Dec 1950 discharge was deleted***

	J	F	M	A	M	J	J	A	S	O	N	D
1948	60.6	50.5	58.2	640	743	1240	1130	1330	1630	882	235	127
1949	71.4	60.3	69.3	453	874	710	1010	1370	1390	773	230	118
1950	60.1	43	48.9	275	1060	949	1930	2020	1630	879	170	766
1951	92.8	76.8	78	171	2240	1240	932	1240	1140	781	260	121
1952	74.8	66.7	62.3	262	1290	1420	1970	2670	1580	920	204	142

7098 Khilok R @ Maleta

- from 1971-75 the two records (RUS & WMO/RIV) are appreciably different
- RUS is significantly lower, but has the same general seasonal pattern
- one or the other of these 1971-75 records is likely for an upstream/downstream site
- annual discharge volumes for RUS become the lowest on record during this period which is some indication that the RUS data may be in error, but there isn't enough evidence to comfortably replace the RUS record
- below is the plot of 12 month running means with breaks due to some missing months during 1971–75 in each series



7168 Khara-Murin @ Murino

- Nov and Dec 1947 discharges stand out as abnormally low and high respectively

	J	F	M	A	M	J	J	A	S	O	N	D
1945	2.99	2.11	1.47	10.00	39.80	39.40	65.30	51.10	95.10	24.00	9.26	6.30
1946	6.27	4.81	2.84	8.49	45.50	48.10	39.80	41.10	26.90	20.20	9.42	4.38
1947	4.02	3.04	1.71	8.71	43.10	55.20	52.80	65.10	34.20	22.50	1.09	69.70
1948	5.66	3.76	3.31	8.32	39.00	91.00	72.00	80.60	55.30	21.80	7.66	5.21
1949	3.94	3.90	3.32	7.53	34.30	51.80	43.40	40.30	40.40	13.90	7.55	5.17

- the adjacent site, ***7167 Snezhnaya @ Vyarino,*** which correlates strongly with 7168, has a different pattern; typically site 7168 discharges are 50–70% of those at 7167; hence, the 7168 discharges are likely in error
- ***thus Nov–Dec discharges are site 7168 were deleted***

		J	F	M	A	M	J	J	A	S	O	N	D
7167	1947	2.95	3.55	3.37	14.60	63.60	109.00	114.00	126.00	59.10	40.40	16.40	12.50
7168	1947	4.02	3.04	1.71	8.71	43.10	55.20	52.80	65.10	34.20	22.50	1.09	69.70

9340 Kan R @ Podporog

- Jan 1976 discharge is too low (7.29); an upstream site 9335 & neighbour 8334, both of which correlate strongly with 9340, have normal Jan discharges 70-80% of the antecedent Dec discharges
- ***Jan 1976 discharge at site 9340 was changed to 72.9***

J	F	M	A	M	J	J	A	S	O	N	D

1974	42.2	30.8	24.6	286.0	605.0	532.0	282.0	160.0	194.0	158.0	73.2	56.1
1975	41.9	41.7	33.3	188.0	856.0	876.0	461.0	369.0	433.0	247.0	108.0	92.3
1976	7.3	39.3	42.1	94.1	546.0	472.0	420.0	519.0	326.0	156.0	55.6	29.7
1977	21.0	22.3	23.9	313.0	956.0	746.0	455.0	320.0	306.0	261.0	121.0	51.2
1978	59.4	46.8	37.8	173.0	890.0	758.0	321.0	322.0	177.0	138.0	80.8	43.3

9455 Norilka R @ Valek

- Sep 1961 discharge is extreme — the highest on record in 43 yrs for Sep by 6-fold
- ***this was deleted***; you may want to change it to 670

	J	F	M	A	M	J	J	A	S	O	N	D
1958	87.0	74.7	55.8	37.1	44.3	801	1090	702	620	300	161	125.0
1959	86.2	58.8	47.6	41.7	47.5	1470	1480	517	262	252	180	111.0
1960	85.0	48.9	33.8	29.6	103.0	806	575	294	236	171	118	82.2
1961	-9.0	-9.0	-9.0	-9.0	53.4	588	2230	1170	6700	428	232	142.0
1962	94.2	65.5	50.9	50.6	60.9	889	2390	1100	639	372	206	149.0
1963	103.0	74.0	46.7	43.3	49.7	994	1940	995	466	363	196	155.0
1964	84.2	56.9	36.2	25.5	54.0	555	1800	1140	983	584	239	175.0

9803 Yenesei R @ Igarka

- For this site, there are 118 significant discrepancies between the RUS record and the UN72/WMO/RIV records (which concur perfectly).
- Most discrepancies [ca. 115 of the 118] occur regularly on the 3 high discharge months (May-July) from 1936–1978.
- As viewed below, differences between the mean monthly discharges of RUS and WMO/RIV for 1936–1978 seem to suggest systematic adjustment.

	RUS	WMO/RIV	dif
May	27,177	30,551	-3,374
June	82,530	76,756	5,774
July	27,967	27,326	642

- It seems plausible that RUS records 1936–1978 have been retrospectively adjusted/corrected at high discharges some time since data were submitted to WMO and before preparation of the Rus-Am exchange file.

- Considering X-file muddies the waters a bit. Usually X-file agrees with RUS, but at this site, X-file concurs 90+% with WMO/RIV.

- Oct 1969 discharge in the RUS file is a probable typo; all other data sets have 9840; the next upstream site on the Yenesei is rather far removed, but Sep-Dec discharges are normal
- ***Oct 1969 discharge was changed to 9810***

	J	F	M	A	M	J	J	A	S	O	N	D
1967	4630	5100	4630	3330	40200	59200	21700	13100	14500	12500	7540	4950
1968	4940	5320	6040	6440	20600	66300	38300	15800	14200	11400	4790	5080
1969	6700	6800	6600	6900	11600	99700	21900	16800	15600	98100	5500	5100
1970	6200	7210	6630	8050	11200	71600	35300	18100	16700	11400	6690	6320
1971	6670	7500	7960	8020	28200	82200	22700	14100	15600	13600	7820	6240

10117 Peschanaya R @ Tochil'noye

- Oct 1944 discharge is clearly in error, the 2nd highest Oct discharge is only 66.6
- ***this was deleted***

	J	F	M	A	M	J	J	A	S	O	N	D
1941	7.35	7.55	13.6	174.0	97.3	38.6	40.9	31.1	22.8	22.5	12.7	10.50
1942	10.20	7.21	9.2	81.2	107.0	41.4	37.1	34.9	18.9	53.0	32.1	17.50
1943	7.01	4.73	6.3	85.9	58.7	50.1	28.5	18.0	15.9	13.1	5.9	8.92
1944	5.03	3.94	15.8	74.0	77.5	32.8	53.5	36.8	23.7	1814.0	11.2	7.76
1945	6.14	3.13	5.1	125.0	35.8	17.0	13.5	12.2	12.7	12.0	10.3	6.44
1946	6.99	5.64	5.0	72.9	51.7	82.0	30.2	30.6	80.2	54.1	39.3	17.80
1947	11.50	6.39	11.5	119.0	75.5	53.0	46.3	43.5	30.1	20.6	20.4	22.50

10240 Tom R @ Novokuznetsk

- Mar 1973 discharge is a typo
- the site is below the confluence of 2 rivers, each with sites (10259 & 10277) not far upstream
- based on summation & prorating of upstream sites, ***the Mar 1970 discharge is likely 103 and was changed accordingly***

	J	F	M	A	M	J	J	A	S	O	N	D
1968	77.0	60.1	171.0	1540	1890	362	283	308	192	179	118	88.5
1969	67.7	63.9	64.1	882	5030	2490	364	374	520	889	265	121
1970	106.0	93.0	10.3	1550	3260	1730	338	438	272	624	208	117
1971	98.1	81.9	82.3	1610	3160	1150	434	252	174	167	143	102
1972	86.0	72.0	109.0	1510	1860	856	878	461	389	513	308	169

10441 Anderma R @ Panychevo

- Jan 1963 discharge is too high; 2nd highest Jan discharge in 34 yrs is only 2.3
- some neighbouring sites [10548, 11309] that correlate with this one show normal discharge for Dec 62 and Jan 63
- ***I changed this to 1.87*** which is about what average ratios suggest it should be

	J	F	M	A	M	J	J	A	S	O	N	D
1961	1.92	1.53	1.46	48.90	38.00	19.30	3.70	2.00	3.85	4.83	3.00	1.85
1962	1.73	1.56	1.56	9.76	28.30	7.00	2.96	2.84	2.09	3.00	2.02	1.67
1963	18.70	1.26	1.31	3.00	42.90	11.70	1.22	1.70	2.93	2.45	4.07	2.26
1964	1.59	1.35	1.26	2.97	64.70	11.90	3.18	2.47	2.81	3.93	3.02	1.82
1965	1.84	1.44	1.77	3.71	60.60	5.66	1.17	1.17	2.77	3.02	2.11	1.59

11056 Irtysh R @ Tobolsk

- Mar 1979 discharge is a typo; 2nd highest Mar discharge for 94 yrs is only 938
- this one looked like it should be 599 & I changed the value accordingly

	J	F	M	A	M	J	J	A	S	O	N	D
1976	613	615	617	987	3720	3620	1930	1300	890	837	714	636
1977	586	607	642	1640	4170	2840	1280	995	1290	1110	982	807
1978	505	567	561	1900	4620	3790	3040	2960	2290	2430	1720	1020
1979	758	632	599000	648	6120	7930	6250	3530	2650	2090	1300	1210
1980	952	771	842	1280	6320	5610	3000	1970	1730	1480	1180	713
1981	661	644	644	1330	5840	5550	2820	1200	779	1110	647	633

11414 Ishym R @ Vikulovo

- I ***changed Mar 1981 discharge to 7.27***
- this is all the data available at this site, but the upstream site ***11410 Ishym R @ Petropavlovsk*** has normal discharge (Feb 3.6, Mar 2.9) so the decision is reasonable

	J	F	M	A	M	J	J	A	S	O	N	D
1980	9.52	7.56	8.01	110.00	500.00	266.00	58.00	37.70	17.30	13.60	12.10	9.08
1981	7.45	7.71	727.00	136.00	250.00	110.00	47.50	18.40	11.80	10.30	8.00	6.92
1982	6.78	6.92	7.68	60.40	74.10	40.40	15.20	9.57	10.50	8.68	5.90	5.45
1983	6.78	7.11	6.35	82.70	470.00	454.00	45.70	24.20	22.00	19.00	13.40	10.60
1984	9.88	8.67	9.57	36.00	218.00	126.00	44.70	13.80	10.80	18.50	13.50	8.93
1986	13.90	17.00	15.30	125.00	540.00	743.00	109.00	53.50	32.00	28.30	26.30	18.90
1987	23.60	24.00	25.70	177.00	568.00	846.00	304.00	46.50	31.60	28.00	20.90	15.60
1988	14.10	13.90	17.80	200.00	424.00	369.00	57.30	30.00	22.50	22.50	20.40	18.80

1989	16.70	16.80	16.90	46.20	190.00	124.00	52.90	19.50	16.80	16.20	16.00	11.80

11801 Ob R @ Salekhard

Before running comparisons, the following problems with replicated records in WMO & RIV were addressed.

- in WMO, Mar–Dec 1944 data were replicated in Mar–Dec 1943
- UN72, RIV & RUS are identical and appear to have the correct data
- the 1944 WMO record is OK

		WMO	UN72	RIV	RUS	X-file
1943	1	6,010	6010	6,010	6,010	5,958
1943	2	3,790	3790	3,790	3,790	3,885
1943	3	2,720	2870	2,870	2,870	2,921
1943	4	2,850	3220	3,220	3,220	3,110
1943	5	21,400	20900	20,900	20,900	13,580
1943	6	32,600	28000	28,000	28,000	28,363
1943	7	28,000	26000	26,000	26,000	26,103
1943	8	18,400	18000	18,000	18,000	18,310
1943	9	12,400	11400	11,400	11,400	11,363
1943	10	11,000	10500	10,500	10,500	10,299
1943	11	5,850	5620	5,620	5,620	5,599
1943	12	3,930	4060	4,060	4,060	4,563
1944	1	3640				
1944	2	3190				
1944	3	2720				
1944	4	2850				
1944	5	21400				
1944	6	32600				
1944	7	28000				
1944	8	18400				
1944	9	12400				
1944	10	11000				
1944	11	5850				
1944	12	3930				

- in WMO, the 1961 record was replicated in 1962
- the other 4 sets agree & appear to have the correct 1962 data

		WMO	UN72	RIV	RUS	x-file
1961	1	5,500	5,500	5,500	5500	5500
1961	2	4,770	4,770	4,770	4770	4770
1961	3	4,050	4,050	4,050	4050	4050
1961	4	5,020	5,020	5,020	5020	5022
1961	5	14,800	14,800	14,800	14800	14536
1961	6	36,900	36,900	36,900	36900	37087
1961	7	34,200	34,200	34,200	34200	34266
1961	8	20,400	20,400	20,400	20400	20635
1961	9	10,700	10,700	10,700	10700	10740
1961	10	9,680	9,680	9,680	9850	9850
1961	11	6,230	6,230	6,230	6240	6240
1961	12	5,690	5,690	5,690	5690	5690
1962	1	5,500	4,840	4,840	4,840	4,840
1962	2	4,770	3,980	3,980	3,980	3,980
1962	3	4,050	3,930	3,930	3,930	3,930
1962	4	5,020	4,560	4,560	4,560	4,562
1962	5	14,800	23,200	23,200	23,200	22,666
1962	6	36,900	30,500	30,500	30,200	30,407
1962	7	34,200	27,500	27,500	27,300	27,548
1962	8	20,400	15,300	15,300	16,100	15,391
1962	9	10,700	11,100	11,100	11,900	11,087
1962	10	9,680	9,570	9,570	10,100	9,570
1962	11	6,230	7,010	7,010	7,010	7,010
1962	12	5,690	5,670	5,670	5,670	5,670

After fixing the replicates and an obvious typo in UN72, UN72, WMO & RIV were all in agreement. Both RUS & X-file had data, so a 3-way comparison was run between RUS, X-file and WMO records:

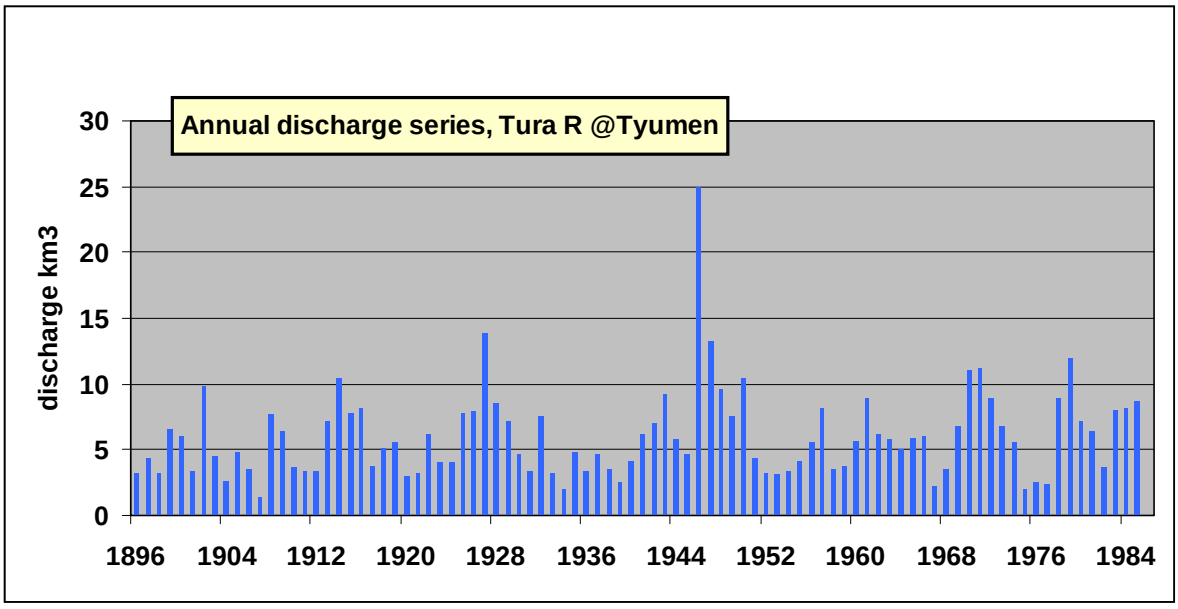
- X-file disagrees with RUS consistently to 1964; much of it is reported to 4–5 digits, so it may have been derived without rounding from a set of dailies from somewhere back in time
- after 64, X-file is mostly identical to RUS except for a few typos.
- in contrast to X-file, WMO is nearly identical to RUS before 1962 and disagrees frequently with RUS post-62. Most discrepancies are minor, but some in the 1960s are potentially significant (>10%).
- From 1970–84, WMO is reported to 4–5 digits, so it may have been derived from a set of daily discharges.
- RUS has no obvious typos and is missing 1976–1980 which both WMO & X have, but X appears to have some typos for May–June 1979. X has 1986–88 which the others don't have.

To build a complete record from 1930–88, RUS was used as the base, 1976–80 were filled in from WMO, and finally 1986–88 were added from X.

12244 Tura R @ Tyumen'

- June 1946 discharge is extreme; the 2nd highest June discharge for 90 yrs is 1590 m^3/s
- the annual discharge volume plot shows that this single dubious datum produces an annual discharge 2-fold higher than any other in 90 yrs; moreover, the 90-yr mean annual discharge is raised 50% from 4 to 6 km^3/s
- ***this was deleted***

	J	F	M	A	M	J	J	A	S	O	N	D
1944	20.1	22.4	27.5	526	707	235	273	170.0	90.8	63.9	29.5	18.7
1945	15.6	13.5	14.1	167	649	430	132	91.1	75.3	76.4	62.4	45.7
1946	26.1	30.4	42.0	355	1750	6810	80	51.5	53.8	158.0	147.0	57.0
1947	37.4	33.8	37.4	926	1270	1190	478	490.0	222.0	127.0	116.0	66.8
1948	53.7	47.4	47.5	564	1310	454	282	327.0	182.0	173.0	102.0	74.6



12517 Lobva R @ Lobva

- RUS generally agrees with UN72/WMO/RIV except for minor discrepancies due to differences in reporting precision. X has no data.
- There's one significant discrepancy (below). Neither RUS nor WMO are near the seasonal. The RUS value is the highest reported May discharge on record, the WMO value is the 3rd lowest.

Keeping RUS for the time being.

	Yr	Mo	RUS	WMO	dif	seasonal	r1	r2
12517	1979	5	157.00	15.50	141.50	75.72	10.1	-7.0

13066 Nura R @ Sergipal'skoye

- 1971 discharges at this site are too high; except for Mar & Apr, 1971 discharges are 1 order higher than the 2nd highest discharge in the available 20 yrs record
- ***the entire year was deleted***

	J	F	M	A	M	J	J	A	S	O	N	D
1966	0.0	0.0	14.0	85.0	12.0	2.0	1.0	1.0	0.0	1.0	1.0	0.0
1967	0.0	0.0	0.0	2.0	1.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0
1968	0.0	0.0	8.0	9.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1969	0.0	0.0	0.0	52.0	1.9	0.3	0.3	0.2	0.2	0.8	0.7	0.3
1970	0.1	0.1	11.0	38.0	1.1	0.2	0.1	0.1	1.1	0.5	0.3	0.0
1971	33.0	32.0	15.8	133.0	155.0	238.0	134.0	41.0	35.5	61.5	64.0	57.0
1972	0.0	0.0	0.0	52.0	17.0	2.4	3.2	1.1	1.1	1.2	1.1	0.5
1973	0.1	-9.0	-9.0	52.0	12.0	1.6	0.7	0.7	0.6	4.4	15.0	4.7
1974	2.5	-9.0	6.4	22.0	4.2	5.2	5.2	5.2	9.1	13.0	5.6	0.8
1975	2.8	3.0	3.3	6.1	5.0	8.7	15.0	19.0	19.5	12.5	7.2	6.0

14414 Karatal R @ Ushtobe

- only available in WMO, UN72 and RIV which are all identical on common months
- data for 1971 clearly do not belong to this site
- ***1971 record deleted***

1969	28.0	36.0	173.0	118.0	253.0	306.0	188.0	74.5	58.0	78.5	-9.0
1970	33.5	71.5	77.5	95.5	79.5	78.5	55.0	42.5	44.0	53.0	59.0
1971	0.0	0.0	0.3	11.0	8.4	1.3	1.3	2.5	1.6	2.0	1.9
1972	31.5	25.0	60.0	128.0	178.0	142.0	106.0	68.0	56.0	78.5	88.0
1973	47.0	46.5	77.0	121.0	130.0	212.0	142.0	26.0	70.0	93.5	82.0

17026 Amu Darya @ Chatly

- given the history of this river [much of the re-engineering of the system that contributed to destruction of the Aral Sea occurred during the 1960s], weird discharge patterns are expected & the record has been left as is

- nonetheless, if occasion arises, you might want to make inquiries about the scattering of apparently anomalous discharges from about 1966–73 [1973 is end of available record]

	J	F	M	A	M	J	J	A	S	O	N	D
1964	416	607.0	265.0	996.0	1620	1900	3400	2100	1390	991	650	502
1965	453	413.0	243.0	319.0	959	1580	1500	1280	917	776	703	521
1966	496	132.0	41.0	449.0	1440	2500	2890	2120	1410	904	714	509
1967	430	294.0	88.0	3.0	994	1750	2220	1970	1220	897	758	516
1968	251	144.0	21.0	198.0	1180	2480	3080	2520	1210	884	620	552
1969	318	498.0	914.0	2190.0	2560	4800	5360	4720	2250	1310	1220	779
1970	711	458.0	9.3	270.0	930	1790	2100	1330	2290	957	727	652
1971	447	137.0	0.8	3.7	240	1330	1300	1450	1460	771	529	167
1972	0	28.5	163.0	202.0	1360	1400	2380	1130	1130	762	423	302
1973	307	158.0	4.2	1130.0	1830	3670	3710	2110	1820	991	527	279

17050 Gunt R @ Khorog

- Sep 1977 discharge is a probable typo
- site 17050 correlates modestly with site 17288 where there is no increased Sep discharge
- ratios suggest that the Sep 1977 discharge at site 17050 should be about 112; hence, ***discharge was changed to 112***

	J	F	M	A	M	J	J	A	S	O	N	D
1975	29	25	24	26	36	232	313	267	112	61	42	32
1976	27	25	24	26	71	170	338	238	123	58	42	33.5
1977	30	26	26	27	46	260	349	233	412	64	42	33
1978	29	25	25	35	86	416	470	277	149	76	50	38
1979	33	29	28	30	39	282	437	263	107	64	44	35.5

19072 Ural R @ Kushum

Mostly RUS agrees with available WMO/UN72/RIV records, but there are some potentially significant discrepancies as noted below. Most look like typos in WMO. Apr 1975 and 1984 WMO values would be the lowest ever by significant margins. Either RUS or WMO May 1967 discharge would be the lowest ever for May, excepting the WMO May 1975.

			RUS	WMO	dif	Seasonal	r1	r1
19072	1967	5	166.0	66.0	100.0	1186.5	-4.7	-5.1
19072	1970	12	93.1	192.0	-98.9	59.9	5.5	21.7
19072	1975	4	468.0	45.0	423.0	586.4	-1.7	-8.0
19072	1975	5	280.0	28.0	252.0	1186.5	-4.1	-5.3

19072	1975	6	126.0	12.5	113.5	392.8	-4.9	-7.0
19072	1975	12	29.3	49.5	-20.2	59.9	-5.0	-1.7
19072	1983	1	64.9	50.0	14.9	56.5	1.4	-1.1
19072	1984	4	225.0	22.5	202.5	586.4	-5.3	-8.3

49036 Kem R @ Yushkozero

Discharges for 1965 in WMO/UN72/RIV appear to be from a different site than those in RUS. The total annual discharge volume calculated from 1965 WMO data exceeds the 12 month maximum for the entire 1928–85 RUS record, so WMO is likely in error.

			RUS	WMO	dif	Seasonal	r1	r1
49036	1965	1	92.9	113.0	-20.1	125.2	-3.5	-1.3
49036	1965	2	72.2	89.0	-16.8	99.4	-4.0	-1.5
49036	1965	3	76.1	91.0	-14.9	85.4	-1.8	1.1
49036	1965	4	77.4	140.0	-62.6	87.3	-1.4	7.5
49036	1965	5	215.0	365.0	-150.0	279.2	-3.0	4.0
49036	1965	6	278.0	371.0	-93.0	360.8	-3.2	0.4
49036	1965	7	284.0	407.0	-123.0	282.2	0.1	6.0
49036	1965	8	289.0	427.0	-138.0	216.7	4.5	13.1
49036	1965	9	257.0	377.0	-120.0	188.0	4.4	12.2
49036	1965	10	363.0	497.0	-134.0	184.7	11.1	19.5
49036	1965	11	322.0	413.0	-91.0	183.2	7.5	12.5
49036	1965	12	248.0	336.0	-88.0	155.2	6.6	12.8

70801 Severnaya Dvina R @ Ust-Pinega

- records existed in RUS & X under ID numbers 70801 (RUS) & 70085 (X) with same discharges except for some missing pieces
- records also existed in UN72, WMO & RIV
- records 70801 & WMO are identical, and UN72 is identical with these on the common months to 1972
- records 70085 and RIV are identical on common months except for 9 differences (1 major, 8 minor)
- records 70801 & WMO relative to 70085 have ca. 13 differences including 1 major typo [see below], 2 modest discrepancies & 10 minor.
- RIV some discrepancies with WMO/UN72, and others with 70085

- the best I can make of it, is that record 70801 from RUS (and WMO & UN72) represent the base Russian record, & that 70085 & RIV are composites that include a few of their own discrepancies, undocumented doctoring of perceived

discrepancies in the other files, and record pieces that may have been released as provisional data.

- Thus, record 70801 was taken as the base, and post 85 records were added from the 70085

y	m	70801	70085	dif	%dif	seasonal	r1	r2
1941	11	1,430	2,130	-700	39.3	2,180	-3.0	-0.2
1941	12	1,210	775	435	43.8	1,290	-0.7	-4.8
1949	5	18,500	1,850	16650	163.6	13,656	6.4	-15.6

† the Seasonal is a robust iterated biweight that should be close to the median of the monthly values. And r1 & r2 are the respective outlier diagnostics for the monthly discharges in records 70801 and 70085 expressed as the ratio of difference between the value & the seasonal to the robust dispersion measure [an iterated biweight that should be close to 1/2IQR or MAD]. By the Mosteller–Tukey critera, ratios of 6–9 are taken to define "Far Out" points, but due to underlying trends in discharge, more conservative (bigger) limits should be used.

- judging from the seasonal, the large discrepancy May 5,1949 appears to be a typo in record 70085

		70801	70085	dif	%dif	seasonal	r1	r2
1949	2	1,190	1,190			795	7.6	7.6
1949	3	885	885			697	4.9	4.9
1949	4	2,730	2,730			1,548	4.7	4.7
1949	5	18,500	1,850	16,650	163.64	13,656	6.4	-15.6
1949	6	4,560	4,560			6,609	-3.5	-3.5
1949	7	1,960	1,960			2,823	-3.8	-3.8
1949	8	1,290	1,290			1,911	-3.8	-3.8

		70801	70085	dif	%dif	seasonal	r1	r2
1941	8	1,450	1,450			1,911	-2.8	-2.8
1941	9	3,910	3,750	160	4.2	2,081	8.6	7.9
1941	10	3,060	2,990	70	2.3	2,642	1.6	1.3
1941	11	1,430	2,130	-700	39.3	2,172	-3.0	-0.2
1941	12	1,210	775	435	43.8	1,285	-0.7	-4.8
1942	1	756	756			1,013	-3.5	-3.5
1942	2	622	622			795	-3.3	-3.3
1942	3	582	582			697	-3.0	-3.0

72818 Neva R @ Novosaratovka

- ***there's 1 significant typo in RUS that was fixed*** ; as the Neva is just a short outlet channel for Lake Ladoga, discharges are very stable & the RUS datum is almost surely in error

			RUS	WMO	diff	seasonal	r1	r1
72818	1975	1	183	1830	-1647	1644	-14.8	1.9

75287 Unzha R @ Makariev

- there's one probable typo in RUS; the Jun 1974 discharge would be the lowest of 90 available years while the previous months discharge was the 4th highest on record
- ***this was changed to the WMO value***

			RUS	WMO	diff	seasonal	r1	r1
75287	1974	6	32.2	322.0	-289.8	155.1	-6.2	8.4

75006 Volga @ Staritsa

- WMO file had a 2nd 1985 record that appears incorrect; May discharge is far too high; hence, 1st wmo record was kept & wmo file was changed

1982	107.0	121.0	91.4	586.0	198.0	174.0	147.0	171.0	71.0	65.0	73.2	97.5
1983	59.5	88.9	248.0	407.0	146.0	116.0	148.0	118.0	45.4	101.0	71.9	85.8
1984	59.7	45.2	38.3	271.0	136.0	158.0	192.0	128.0	153.0	177.0	130.0	50.3
1985	39.9	60.6	140.0	406.0	261.0	220.0	171.0	138.0	139.0	160.0	257.0	76.4
1985	156.0	168.0	171.0	968.0	1030.0	267.0	281.0	224.0	229.0	324.0	264.0	209.0

75591 Lukh @ Lukh

- Apr 1962 discharge is a probable typo; 2 neighbours (75303, 75576) that correlate well with 75591 have normal discharges
- ***Apr 1962 discharge was changed to 21.7***

	J	F	M	A	M	J	J	A	S	O	N	D
1960	0.70	0.61	0.45	30.80	2.08	0.90	0.57	0.53	0.88	1.33	1.40	1.76
1961	1.64	1.22	1.28	38.40	2.70	0.83	0.83	0.57	0.76	0.99	1.13	1.11
1962	0.75	0.88	1.01	2.17	3.04	1.08	5.31	4.73	6.94	4.40	3.02	2.00
1963	1.15	0.92	1.08	28.80	2.90	0.61	0.53	0.43	0.67	0.83	1.38	1.21
1964	1.12	0.96	0.92	11.50	1.88	0.65	0.32	0.61	0.68	0.79	1.19	1.21

- Mar 1983 discharge is unusually high; discharges were also above normal at regional sites, but ratios suggest the Mar 1983 discharge at 75591 should have been in the 3.3–6.6 range so 6.1 may be the correct value
- evidence is a bit weak, so this was left unchanged for the time being

	J	F	M	A	M	J	J	A	S	O	N	D
1981	2.41	2.42	2.16	45.60	13.60	0.85	0.70	0.69	1.35	1.66	1.75	1.77
1982	1.84	1.62	1.52	27.90	5.07	1.76	1.19	0.77	1.10	3.30	6.18	5.37
1983	4.07	2.20	16.10	21.00	1.91	2.09	2.07	1.83	1.56	2.88	2.61	5.81
1984	1.93	1.26	1.21	17.10	1.75	1.03	0.92	1.12	1.84	5.28	4.27	1.44
1985	1.50	1.52	1.27	40.20	14.20	17.40	5.41	4.02	2.07	3.53	13.60	1.96

75623 Sura @ Kadyshev

- July 1960 discharge (4.26) is a probable typo; the upstream site 75620 has normal discharge
- ***this was changed to 42.6***

	J	F	M	A	M	J	J	A	S	O	N	D
1958	46.1	42.1	45.7	485.0	151.0	75.2	63.4	57.8	56.3	54.7	49.5	51.8
1959	39.5	42.8	45.6	662.0	105.0	67.6	55.3	53.6	46.8	48.7	37.0	32.3
1960	32.8	39.3	57.8	648.0	82.0	50.1	4.3	38.0	36.4	38.2	30.4	59.8
1961	36.7	36.9	82.7	890.0	103.0	62.8	55.1	45.5	45.6	44.0	42.3	38.7
1962	36.3	42.7	99.2	400.0	100.0	74.2	61.6	57.7	53.6	51.0	52.4	41.3

75674 Vetluga @ Mikhailovitsy

- Oct 1976 discharge is a probable typo; 2 neighbours (76619, 75682) that correlate very strongly have Oct discharges slightly lower than Sep & slightly higher than Nov
- ***Oct 1976 discharge at site 75674 was changed to 19***

	J	F	M	A	M	J	J	A	S	O	N	D
1974	28.8	22.0	19.6	128.0	1130.0	212.0	25.2	21.8	16.3	16.6	28.6	29.6
1975	19.2	19.2	18.5	423.0	78.8	29.4	13.8	12.7	13.0	12.3	13.5	12.6
1976	12.0	11.2	11.7	114.0	555.0	241.0	89.6	26.7	21.7	0.19	18.1	15.5
1977	14.8	14.0	12.3	210.0	125.0	26.4	15.5	11.4	10.5	28.9	99.4	86.4
1978	23.7	16.4	19.0	389.0	300.0	295.0	230.0	208.0	129.0	230.0	163.0	54.6

76518 Dymka @ Tatarskaya Dymskaya

- Jan 1962 discharge is a probable typo; discharges at 2 neighbours (76512, 77231) that correlate very strongly with 76518, lie between Dec 61 & Feb 62 discharges
- ***Jan 1962 discharge at site 76518 was changed to 0.75***

- May 1962 discharge is too low & a probable typo; the neighbours have May discharge 20–25% of Apr discharge suggesting that May discharge at site 76518 should be in the 2.2–2.75 range
- ***May 1962 discharge was deleted*** as the legitimate value was unclear

	J	F	M	A	M	J	J	A	S	O	N	D
1960	1.18	1.04	1.24	16.10	1.77	1.43	1.29	1.24	1.15	1.30	1.10	1.44
1961	0.91	0.86	11.00	8.63	1.60	1.42	1.07	0.98	1.11	1.07	0.78	0.64
1962	7.50	0.06	1.36	11.00	0.10	1.48	1.20	1.23	1.32	1.43	1.27	1.07
1963	0.97	1.14	0.98	22.70	2.79	1.58	1.42	1.25	1.19	1.30	1.40	1.19
1964	0.83	1.12	1.02	13.40	3.59	2.04	1.90	1.56	1.48	1.48	1.39	0.98

- Apr 1971 discharge is a probable typo; the neighbours have Apr discharges about 16-fold higher than Mar which suggests a Apr discharge of 23 for site 76518
- ***discharge was changed to 14.5*** which seems like what was intended; this catchment is smaller & more prone to local variation

	J	F	M	A	M	J	J	A	S	O	N	D
1969	1.36	1.53	1.08	14.40	1.85	1.13	1.86	1.35	1.15	1.34	1.35	1.02
1970	1.05	1.05	1.06	16.50	2.34	1.67	1.50	1.54	1.48	1.43	1.87	1.34
1971	1.21	1.36	1.44	1.45	4.70	2.79	2.30	2.02	1.73	2.00	2.08	2.00
1972	1.85	1.34	1.68	20.40	2.59	1.95	1.51	1.31	1.45	1.48	1.57	1.49
1973	1.48	1.33	1.42	7.80	2.41	1.71	1.77	1.70	1.86	1.96	2.19	1.47

76553 Vyatka @ Ustievskaya

- May 1945 discharge is a probable typo; nearest neighbour 76593 & downstream Vyatka sites correlate very strongly & all have significant May 1945 discharge
- ***May 1945 discharge was changed to 631*** which gives about the same May/Apr ratio as at nearest neighbour 76593

	J	F	M	A	M	J	J	A	S	O	N	D
1943	17.6	16.4	27.2	361.0	759.0	142.0	86.1	115.0	111.0	181.0	79.6	40.2
1944	33.2	32.0	35.5	79.6	1080.0	283.0	199.0	158.0	153.0	150.0	68.9	37.6
1945	26.1	21.3	21.3	31.0	63.1	222.0	91.1	36.1	43.5	90.4	110.0	39.7
1946	27.2	26.8	29.5	71.0	858.0	86.1	54.8	35.3	140.0	148.0	107.0	47.4
1947	30.3	23.0	24.8	302.0	1120.0	295.0	89.6	80.8	58.0	117.0	78.1	45.1

76556 Vyatka R @ Kirov

- there's a data entry error at July 1974 RUS; ***this was changed to the WMO value***
- July discharges don't go to 0 at this site, and discharges of pre- & post- months are far too high to consider the possibility

			RUS	WMO	diff	seasonal	r1	r1
76556	1974	7	0	214	-214.0	218	-8.7	-0.2

76566 Vyatka @ Akutkol

- Jun 1973 discharge is a probable typo; all the Vyakta sites & neighbours have appreciably higher discharges relative to May and July discharges
- ***Jun 1973 discharge was changed to 260*** which is about what the neighbouring sites suggest it should be

	J	F	M	A	M	J	J	A	S	O	N	D
1971	201	183	153	1310	2820	1150	793	413	299	348	630	700
1972	389	221	213	1820	3450	1060	338	188	169	232	247	220
1973	203	156	170	1720	1310	26	191	216	256	439	384	287
1974	250	200	204	1560	5460	2200	535	322	278	249	275	294
1975	216	206	220	2400	929	356	214	179	180	191	192	152

77801 Volga @ Verkhne-Lebyazh'ye

- May 1962 discharge is a typo; discharge at Volgograd (site ***77090***) upstream was normal (20,600)
- ***May 1962 discharge was changed to 19600***

	J	F	M	A	M	J	J	A	S	O	N	D
1960	6280	5970	6000	7490	14000	12700	4760	4490	4290	4190	4200	3910
1961	3740	4280	5040	9060	19900	14500	6260	5000	4700	4450	5040	5220
1962	4260	5940	6360	7570	1960	7590	5740	6680	6520	6510	6250	6050
1963	6040	7090	7880	8240	19100	16300	6580	5830	5550	5590	5230	5550
1964	5470	6710	6240	6020	13500	9190	6300	5700	5580	5540	5450	5370

78011 Don (likely) @ near Pavlovsk

- this site correlates most strongly with ***Don R @ Kazanskaya*** *78011*, and is likely located upstream on the Don somewhere near Pavlovsk
- in the main file, at site 78011, Mar–Dec of 1910 and 1911 were identical
- though discharge patterns at sites 78011 & 78013 are closely related, it's not clear from 1911–12 discharges at site 78013 whether the Mar-Dec data at site 78011 are for 1910 or 1911
- for operational purposes, ***I deleted Mar–Dec 1911***

	J	F	M	A	M	J	J	A	S	O	N	D
1909	60.6	87.8	81.4	592.0	273.0	146.0	144.0	92.4	85.3	83.1	92.9	77.2
1910	64.3	78.8	98.2	1160.0	204.0	121.0	133.0	107.0	92.6	92.9	98.3	65.0
1911	91.3	74.4	98.2	1160.0	204.0	121.0	133.0	107.0	92.6	92.9	98.3	65.0
1912	63.7	71.7	161.0	1460.0	244.0	162.0	145.0	104.0	101.0	112.0	92.5	78.0

- the Aug 1903 discharge is another highly probable typo
- ***this was deleted***

	J	F	M	A	M	J	J	A	S	O	N	D
1901	69.2	104.0	679.0	1970.0	245.0	127.0	102.0	89.3	97.5	98.5	98.1	76
1902	135.0	246.0	367.0	1480.0	252.0	147.0	129.0	106.0	97.6	107.0	82.5	71
1903	72.0	85.0	500.0	795.0	163.0	179.0	120.0	1.0	93.3	98.4	115.0	98.5
1904	72.0	140.0	116.0	1460.0	590.0	121.0	118.0	101.0	92.2	99.1	120.0	129
1905	94.6	75.0	87.0	1190.0	195.0	99.4	85.3	80.1	92.5	114.0	132.0	124

- Sep 1981 discharge is a typo; discharge downstream at site 78013 was normal
- Sep 1981 discharge was changed to 158

	J	F	M	A	M	J	J	A	S	O	N	D
1979	133	309	325	3010	339	151	148	141	138	151	166	177
1980	126	131	128	1100	311	210	191	181	194	210	234	303
1981	341	300	577	1750	372	195	145	132	15.8	198	227	233
1982	227	170	278	483	287	176	212	181	157	211	237	228
1983	234	261	965	910	276	197	169	165	161	187	182	190

78054 Sosna @ Elets

- Jun 1981 discharge (6.23) is a typo
- neighbouring (75309) and downstream (78011 above) sites have normal discharge
- ***Jun 1981 discharge was changed to 62***

	J	F	M	A	M	J	J	A	S	O	N	D
1979	36.7	106.0	166.0	556.0	63.5	40.2	46.8	41.3	42.0	43.3	46.0	39.0
1980	32.8	33.0	34.0	336.0	66.4	52.8	62.1	57.5	52.8	53.5	69.2	83.9
1981	69.2	83.9	353.0	183.0	86.4	6.2	50.3	49.0	52.8	56.8	62.9	80.7
1982	65.8	61.0	173.0	147.0	83.6	66.6	72.1	61.8	53.7	67.3	62.3	64.1
1983	65.9	76.8	243.0	98.3	75.2	60.0	55.4	53.0	51.2	60.3	62.4	59.4

78202 Medveditsa R @ Archedinskaya

- mean discharges drop >10 fold in RUS for 1981–84; WMO record appears OK & was substituted

1979	23.2	24.1	70.7	664.0	446.0	54.3	31.9	24.4	20.8	21.6	24.2	22.8
1980	20.4	21.0	18.8	238.0	160.0	41.6	27.7	22.1	20.7	22.8	24.3	32.0
1981	4.7	1.9	37.8	19.3	3.6	1.1	0.8	0.7	0.5	1.0	1.1	1.4
1982	1.8	1.3	3.0	11.6	4.6	1.1	0.9	0.8	0.8	1.0	1.6	2.2
1983	2.2	3.6	33.5	8.8	3.7	1.3	0.3	0.5	0.4	0.4	0.5	0.6
1984	0.5	0.5	0.5	11.4	0.8	0.1	0.0	0.0	0.0	0.0	0.1	0.4
1985	21.0	19.7	21.6	206.0	72.9	28.6	33.5	20.1	18.2	21.2	23.2	28.5

78801 Don R @ Razdorskaya

- there are 45 or so perceptible discrepancies between RUS & WMO which suggests that there may have been some retrospective revision of the record

81068 Dniestr @ Bendery

- 1969 & 1970 records in WMO file were identical
- UN72 & RIV had different 1970 data that appear correct

84108 Terek @ Ordzhonikidze

- July 1931 discharge is a probable typo; the lowest July discharge in 62 yrs record
- this Transcaucasus site correlates with nothing else in the set
- as per pre- & post-months, July discharge should be from 65–140 with mean 85
- ***it's a bit iffy, but July 1931 discharge was changed to 126***

	J	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
1929	12.2	10.6	8.7	17.2	54.1	66.3	119.0	70.6	34.7	22.7	15.1	11.2
1930	10.8	11.4	10.7	13.2	25.5	53.6	84.9	68.3	37.9	24.6	17.7	12.8
1931	11.3	10.1	11.2	15.3	32.7	79.7	12.6	69.5	44.6	22.9	20.5	15.7
1932	12.9	12.3	14.3	23.7	58.0	98.5	77.5	66.3	50.1	28.2	18.3	15.0
1933	12.2	11.5	10.9	14.9	29.5	44.0	60.5	58.4	51.2	35.7	20.1	15.7

Appendix A — Russia–FSU Basin/Gauge Codes

- geographic summary of basin/gauge codes found in NCAR Russian data set are given in the table below
- this is not the most rational system that might have been devised
- generally, the basin / hydrologic unit number is the integer left after dividing the gauge code by 1000
- by the Russian/FSU system, units 1–17 are considered Asia, and units 18–85 are considered Europe

Code	Watershed	Rivers	Receiving Waters
1000-1999	NE Siberia	Kolyma, Anadyr, Amguena	Arctic Ocean, East Siberian Sea, Chukchi Sea, Pacific Ocean, Sea of Okhotsk
2000-2999	Kamchatka	Kamchatka, Penzhina	Pacific Ocean, Sea of Okhotsk, Bering Sea
3000-3999	NE Siberia	Lena, Indigirka, Olenek, Anabar, Yana, Alazeya	Arctic Ocean, E Siberian Sea, Laptev Sea
4000-4999	Sakhalin Island	Tym	Sea of Okhotsk
5000-5999	lower Amur & independent drainage to Japan Sea from Primorsky Kray	Amur, Amgun, Nimelen, Razdol'naya	Japan Sea, Pacific Ocean
6000-6999	upper Amur	Amur, Shilka, Ingoda, Selemdzha, Bureya, Zeya	Pacific Ocean
7000-7999	Lake Baikal	Selenga, Barguzin, Chikoi, Khilok	Baikal > Angara > Yenesei > Kara Sea > Arctic Ocean
8000-8999	Angara d/s Baikal	Irkut, Iya, Biryusa	Angara > Yenesei > Kara Sea > Arctic Ocean
9000-9999	Yenesei excluding Angara–Baikal, may include independent Kara Sea drainage	Kan, Tuba, Norilka, Abakan, Podkamennaya-Tunguska, Nizhnyaya-Tunguska; may include Pyasina, Taymra & other independent Kara Sea drainage	Yenesei > Kara Sea > Arctic Ocean
10000-10999	Ob - u/s Irtysh,	Tom, Tym, Bia, Bolshoi	lower Ob > Obskaya Gulf >

	presumably to source	Yugan, Charysh, Chulym, Kiya	Kara Sea > Arctic Ocean
11000-11999	Obskaya Gulf	lower Ob, Severnaya Sos'va, Irtysh (except Tobol), Ishym, Konda, Om, plus Nadym, Taz, Pur & likely other small Obskaya Gulf drainage independent of the Ob proper	lower Ob > Obskaya Gulf > Kara Sea > Arctic Ocean
12000-12999	Tobol trib of Itrysh trib of Ob	Tobol, Lobva, Sosva, Tura,Uy, Nitsa, Pyshma	Irtysh > lower Ob > Obskaya Gulf > Kara Sea > Arctic Ocean
13000-13999	Turgai & L Tengiz	Turgai, Kara Turgai, Nura	Lake Tengiz; Kazakhstan closed basin
14000-14999	Lake Balkash	Sharyn, Lepsy, Karatal, Ili	Lake Balkash; Kazakhstan closed basin
15000-15999	Lake Issyk Kul	Chu	Lake Issyk Kul; Kyrgyzstan closed basin
16000-16999	Syr Darya	Syr Darya, Naryn, Arys	Aral Sea closed basin
17000-17999	Amu Darya	Amu Darya, Gunt, Vakhsh, Zeravshan	Aral Sea closed basin
18000-18999	Ural	Ural, Maly Uzen, Ilek	Caspian Sea, closed basin
41000-41999	Piarnu	Piarnu	Gulf of Riga > Baltic > Atlantic Ocean
48000-48999	Lake Onega ?	Suna	Lake Onega > Lake Ladoga > Neva > Baltic > Atlantic
49000-49999	Gulf of Onega	Kem, Vyg	Gulf of Onega > White Sea > Barents Sea > Arctic Ocean
70000-70999	White Sea — Pechora Sea	Onega, Severnaya Dvina, Mezen, Pechora, Kuloi	White Sea, Pechora Sea Barents Sea > Arctic Ocean
71000-71999	Kola Peninsula	Ura, Pecha, Kola, Kitsa, Ponoi, Umba, Kolvitsa	White Sea, Barents Sea > Arctic Ocean
72000-72999	Gulf of Finland	Neva, Lake Ladoga (excluding Lake Onega), Narva, Luga	Gulf of Finland > Baltic > Atlantic
73000-73999	Gulf of Riga excluding Piarnu	Gauja (Gauya), Daugava	Gulf of Riga > Baltic > Atlantic Ocean
74000-74999	Baltic Proper	Neman, small tribs, likely Pregolya	Baltic > Atlantic

75000-75999	upper Volga; roughly above Kazan / Kuybyshev reservoir	Klyaz'ma, Moksha, Mologa, Oka, Sura, Ugra, Unzha Vetluga	lower Volga > Caspian Sea, closed basin
76000-76999	upper Volga – NE tribs affluent to Kuybyshev reservoir	Vyatka, Belaya, Kama, Vishero, Chepsta, Ai, Ufa, Dema, Ik	lower Volga > Caspian Sea, closed basin
77000-77999	mid Volga; roughly from Kuybyshev reservoir to Volgograd	Samura, Bolshoi Kinel & mostly small tribs	lower Volga > Caspian Sea, closed basin
78000-78999	Don	Don, Khoper, Seversky Donets, Medveditsa	Sea of Azov > Black Sea > Mediterranean Sea > Atlantic
79000-79999	upper Dniepr; u/s Kiev res., mostly in Belarus & Russia	Dniepr, Pripyat, Vyazma	Black Sea > Mediterranean Sea > Atlantic
80000-80999	lower Dniepr; d/s top of Kiev reservoir	Dniepr, Desna, Seym,	Black Sea > Mediterranean Sea > Atlantic
81000-81999	Black Sea northwest coast	Dniestr, Yuzhny Bug	Black Sea > Mediterranean Sea > Atlantic
82000-82999	Black Sea east coast	Rioni, likely other tribs entering from Georgia	Black Sea > Mediterranean Sea > Atlantic
83000-83999	Kuban	Kuban	Sea of Azov > Black Sea > Mediterranean Sea > Atlantic
84000-84999	Caspian Sea northwest	drainage north of Caucasus including Kalaus, Terek, Samur	Caspian Sea, closed basin
85000-85999	Caspian Sea southwest;	drainage south of Caucasus including Kura, Aras (Arax); L Yerevan from lands of Azerbaijan, Armenia, Iran, Turkey	Caspian Sea, closed basin