

Data Rescue for precipitation station network in Slovak Republic



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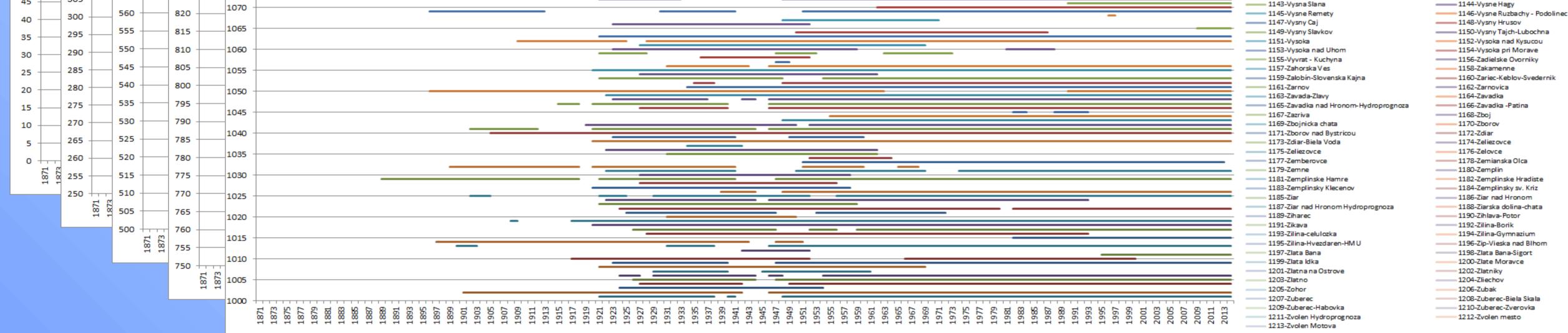
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ABSTRACT

Transparency of archive catalogues presents very important task for the data saving. It helps to the time being visualization of time series continuation in precipitation stations (approximately 1250 stations) is under way in Slovak Republic since the beginning of observation (meteorological stations gradually began to operate during the second half of the 19th century in Slovakia). Visualization is joined with the activities like verification and accessibility of the data mentioned in the archive catalogue, station localization according to the historical annual books, conversion of coordinates into x-JTSK, y-JTSK and hydrological catchment in the map and visualization of the data duration (line graph) will lead to the effective assignment of corresponding precipitation stations for the process of turn or trend detection and homogenization. The risks and problems at verification of records from archive catalogues, their digitalization, repairs and the way of visualization will be seen in poster. During the searching process of the historical and often short time series, we realized the importance of mainly those stations, located in the middle and higher altitudes. They might be used as replacement for up to now quoted fictive points used at the construction of precipitation maps. Supplementing and enhancing the time series of individual stations will enable to follow changes in precipitation totals during the certain period as well as area totals for individual catchments in various time periods appreciated mainly by hydrologists and agro-climatologists. Time Series in alphabetical orde

rig. I Time Series in alphabetical order		Fig. 2 Station Frequency
Accessibility of data from precipitation station network (first 250 from 1213) for 1871-2014	1-Abelova 2-Adamovske Kochanovce 3-Adidovce 4-Andovce 5-Antol 6-Asot-O koc-Topolniky	Precipitation station network 1871-2014
		900
Accessibility of data from precipitation station network (251-500 from 1213) for 1871-2014	253-Handlova-Gymnazium 254-Hanusovce-nad Toplou	

Acce	essibility of data	Tom precipitation station network (251-500 from 1215) for 1871-2014	253-Handlova-Gymnazium 255-Harichovce	254-Hanusovce-nad Toplo 256-Hatiny	u la	700
			257-Hatne	258-Helpa		
	Accessibility	of data from presinitation station naturall (E01 7E0 from 1212) for 1971 2014	501-Levi 503-Levo	ca-mesto ==== 502-Levi ca-mesto ==== 504-Levi	oca-Levocska dolina oca-Peklo	Archive
505	Accessibility	of data from precipitation station network (501-750 from 1213) for 1871-2014	505-Levo	ca-Vodaren 506-Lev	oca-Zeleznicna stanica	5 00 — — — — — — — — — — — — — — — — — —
500			507-Leve	4 E10 Lim	hach	400 Database
	A = = = =	-:::::::::::::::::::::::::::::::::::::		751-Petrovice 753-Pezinok-Myslenice-Grinava		<u>е</u> 300 -
495 75	Acces	sibility of data from precipitation station network (751-1000 from 1213) for 1871-2014				
490 74	15					200
		Accessibility of data from precipitation station network (1001-1213 from 1213) for 1871-2014		1001-Svedernik-Zariec-Keblov 1003-Svermovo-Puste Pole	1002-Svedlar 1004-Svermovo-Telgart	100
485 74	1000	Accessibility of data from precipitation station network (1001-1215 from 1215) for 1671-2014		1005-Sverzov		0
480 73	995			1007-Svinia	1008-Svinica	822 822 822 822 822 822 822 822
475					1010-Tatranska Lomnica 1012-Tatranske Zruby	
475 73	990 1215			1013-Tekovske Luzany-Medvecke	1014-Tepla, Podhorie - Tepla	Designations and facto during the presson of
470 72	985 1210			1015-Teply Vrch	1016-Terany	Basic steps and facts during the process of
465 72				1017-Terna 1019-Tisovec	1018-Tesarske Mlynany 1020-Tisovec-Banovo	Rescue of precipitation station network in condit
	980 1205			1021-Tomasikovo	1022-Topolcany	Slovakia:
460 71				1023-Topolcianky 1025-Torysky	1024-Toporec 1026-Tovame	1. Archive catalogue, which consists preci
455 71	.0 970 1200			1025-1075Ky	1028-Trebisov-cerpacia stanica	station name, period of observation (from-to),
	1195				1030-Trebisov-Plan	
450 70	965 - 1155			1031-Trencianske Teplice 1033-Trencin-Biskupice	1032-Trencin 1034-Trepec	indicative (if exists) and the place (drawer) in a
445 70	960 1190			1033-Trencin-Biskupice 1035-Trhova Hradska	1034-1 repec 1036-Trhoviste	Stations were in alphabetical order, with many
440				1037-Tri Vody	1038-Trnava Hora-Jaina	and duplicities coming from the fact that many s
69	95 955 1185			1039-Trnava-Hospodarska skola 1041-Trnovec nad Vahom		have changed location during the histo
435 69	950 - 1180				1044-Trstice	observation so they got two or three name
430				1045-Trstin	1046-Tura Luka	
00	945 1175			1047-Turany nad Ondavou 1049-Turcianska Stiavnicka	1048-Turcek 	changeable order in the list. These duplicitie
425 68				- 1051-Turie	1050-runianske Podhradie-Tuma nad Bodvou	been eliminated after first round of station visua
420	1170			1053-Turzovka		in tabular form.
67	935 1165			1055-Tvrdosin 1057-Ubla	1056-Tvrdosovce 1058-ubova/Zerin Horaren okr. Martin/	2. Stations have been sorted in alphabetical or
415 67	930 930			1059-Ubrez	1060-Udavske	better find if indicative does not exist) and
410 66	925 1160			1061-Uhorna 1063-Ulanka-Banska Bystrica	1062-Uhrovec 1064-Ulic	precipitation station has adopted code number
405				1065-Uloza-Levoca		
66	920 1155			 1067-Ustie nad Oravou-Strkovisko 1069-Valaska Bela 	1068-Vahovce 1070-Valaska Dubova	graphs have been drawn (Fig. 1). Because o
400 65	915 1150			1005-Valaska Bela	1072-Valaska Dubova	sheet does not enable to display more than 25
395 65	910 - 1145			1073-Varin	1074-Vazec	series (lines), 1213 precipitation stations have
	1145			1075-Vcelare 1077-Velaty	1076-Veca nad Vahom 1078-Velka Domasa	divided into five line graphs sorted by station
64	905 1140			1079-Velka Ida	1080-Velka Javorina	This is useful for knowing the length of the time
385 64				1081-Velka Lehota 1083-Velka Mana	1082-Velka Lomnica 1084-Velka nad Iplom	of concrete precipitation station.
380	1135			1085-Velka Maha	1086-Velke Kosihy	· · ·
375 63				1087-Velke Kozmalovce	1088-Velke Levare	3. Number of precipitation time series since 18
63	80 890 1130			1089-Velke Ludince 1091-Velke Ripnany , Male Ripnany	1090-Velke Pole 1092-Velke Rovne /Podivor/	be seen in Fig. 2, archived (red line) and dig
370	885 1125			1093-Velke Trakany	1094-Velke Uherce	(blue line). It means that almost 60% of preci
365 62	885 1125			1095-Velke Zaluzie	1096-Velky Bab-Bab	data are not in database.
62	880 1120			1097-Velky Blh 1099-Velky Grob	1098-Velky Folkmar 1100-Velky Hores	4. In coincidence with the annual books the
360 61	.5 875 1115				1102-Velky Kliz-Klizske Hradiste	
355	1113			1103-Velky Kliz-Vrch Hora	1104-Velky Krtis	longitude as well as altitude have been added
350 61	870 1110			1105-Velky Lapas 1107-Vernar	1106-Velky Lipnik-Haligovce 1108-Veskovce	exact period and precipitation station. Geo
60				1109-Vieska nad Blhom	1110-Vieska nad Zitavou	coordinates have been transformed to
345	1105			1111-Viglas 1113-Viglasska Huta-Kalinka		coordinates for GIS visualization.
					1116-Vinne	5. Precipitation data are useful for many
59	855 1100			1117-Vitanova	1118-Vlachovo	especially for hydrology. That's why w
	850 1095			1119-Vlachovo-Sulova 1121-Vlkyna		
330 59				1123-Vojcice		hydrological catchments (Fig. 3). Precipitation
325 58	85 845 1090			1125-Vojka	1126-Vrable	have been placed into the catchments of Sloval
58	80 - 840 - 1085			1127-Vrakuna 1129-Vratna dolina-Terchova	1128-Vranov nad Toplou 1130-Vrbicke Pleso	4). To be clear concrete catchment should be
320	1085			1131-Vrbovce	1132-Vrbove	(example Fig. 5 4-23-01 and later on other pa
315 57	835 1080			1133-Vricko 1135-Vydrna	1134-Vtackovce 1136-Vyhne	
57				1135-Vydrna 1137-Vyhne-Banky	1136-Vyhne 1138-Vychodna	catchments of 04-23).
310	1075			1139-Vyrava	1140-Vysna Boca	6. Overlapping periods of observations at preci
305 56	825			1141-Vysna Jablonka 1143-Vysna Slana		stations in chosen 04-23-01 catchment are
	1070					



-23-01 catchment are shown (Fig. 6).

7. Data processing according to standard procedures and rules (e.g. MISH, MASH, AnClim etc.) (Fig. 7). 8. Special (future) task: Mountain stations (often in rare location) not yet digitalized have been separated from the list (Fig. 8). Their time series have various length lying in various altitudes and catchments. According to the digitalized data stored in database and not digitalized data observing at the same time mountain stations may be supplemented and homogenized.

9. Most of the stations not in database but important for mountain precipitation investigation lies in the altitude 500-2000 m a. s. l. (Fig. 9) with the peek of occurrence in altitude interval 701-800 m. Benefit consists of better identification of precipitation and snow conditions in higher altitudes for space data processing dealing with river drain and flow from concrete catchment as well as prediction of avalanches alert.

Fig. 3 Catchments

Polan 4-21-03 4-21-06 Czech Republic 4-21-07 4-21-04 4-30-09 4-30-08 3-01-03 3-01-02 4-32-04 4-21-08 4-21-02 4-21-05 4-30-03 4-21-01 4-32-01 4-21-09 4-30-0 4-32-03 4-21-11 4-13-03 4-23-01 4-23-02 4-32-02 4-30-04 4-32-05 4-31-01 4-21-10 4-30-10 4-30-06 4-23-04 4-23-03 4-17-02 4-21-12 4-33-01 4-31-02 4-21-16 4-30-07 4-30-02 Ukraine 4-21-13 4-24-01 4-21-15 4-30-11 4-31-03 4-30-01 4-24-02 Leaend 4-24-03 4-21-14 – rivei catchment 4-21-17 Hungar 4-23-05 state boundary 4-21-18 Elevation /m a.s.l./ 94 200 300 500 700 1 000 1 200 1 500 1 800 2 200 2 500 2 65 4-20-01 4-20-02

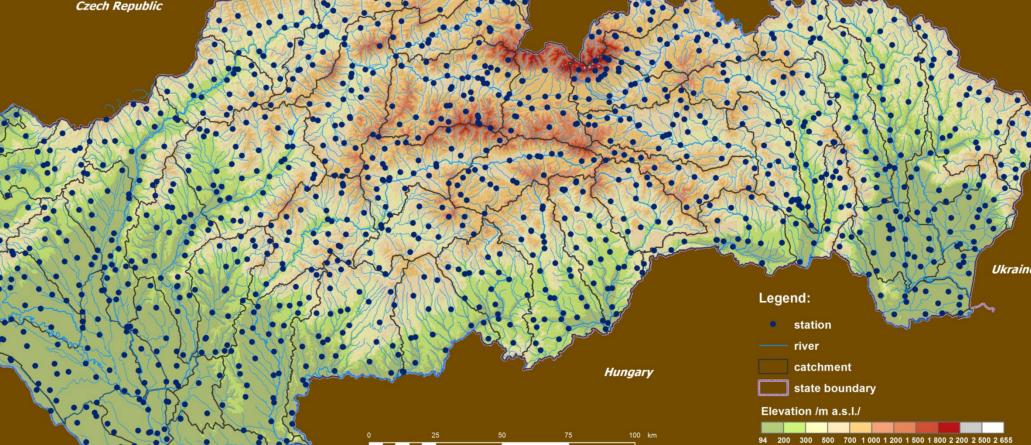


Fig. 5 Hron River catchments 4-23-01 (4-23-02, 4-23-03, 4-23-04, 4-23-05)

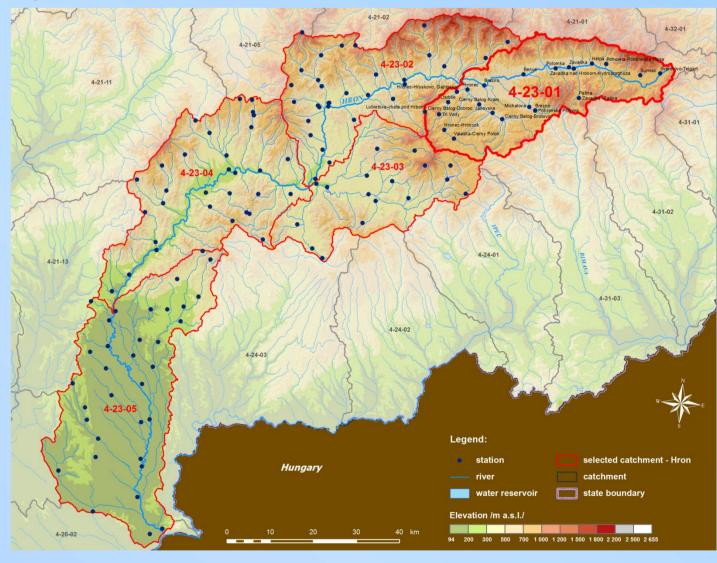


Fig. 9 Mountain stations (not digitalized) – altitude occurrence

Occurrence of selected mountain stations for Data Rescue acording to their altitude

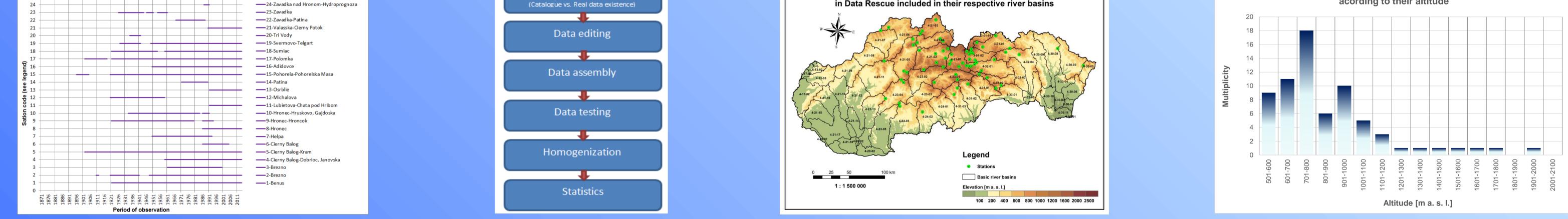
Fig. 7 Data processing

Data verification

Mountain stations in Slovak republic selected due to their importance

Fig. 4 Precipitation station network 1871-2014 in catchments

Fig. 8 Mountain stations (not digitalized) – placement in catchment



CONCLUSION

Archive data represent national heritage. Data Rescue is the ongoing process of preserving all data at risk of being lost due to deterioration of the medium and digitizing current and past data into computer compatible form for easy access. The establishment of the data rescue team plays important role and its activities have a high priority within WMO Programs that's why national activities have been mentioned. Many problems dealing with station names consisting of more words, or having been written down twice or more times in the catalogue under the identical time of observation concerning place and position of the station in annual books had to be solved before assigning code for line graph (Fi. 1) describing the time series. Most of the precipitation data have not been digitalized yet (Fig. 2). Professional staff is shrinking (retiring) and students cannot substitute this kind of work. Daily or monthly data have to be decided for digitalizing. Project for data rescue should be supplied and managed internationally. Precipitation data dropping in certain catchment (e.g. there is depicted the catchment of the Hron River) play significant role for the assessment of river flow rate and 5), snow loading and water snow cover, preparation of standards and determination of areas from the point of avalanches alert as well as tourism. These knowledges lead us to the future solution of mountain stations operated often by foresters (Fig. 8 and 9) and situated in very interesting and significant altitudes in such a way as to include the data from these stations into the future data processing. Homogenization of precipitation data of individual catchments will result in possibility to compare precipitation with hydrological relations of the same season and catchment for surface as well as ground water. **Acknowledgment:**

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REFERENCES

http://www.wmo.int/pages/prog/hwrp/datarescue.php

Fig. 6 Precipitation station network (04-30-03 catchment) in time series

Overlapping periods of observation in 4-23-01 catchment