Reproducing upper air temperature, humidity and wind characteristics in late 1930s-1960s by reanalyses

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http://www.meteo.ru
Upper-air data (41 stations)
Upper-air data

The final U/A dataset was compiled from three sources and put into single format as it was done for the U/A data in previous ERA CLIM Project. **The amount of soundings: 390 873. The amount of levels: 8 993 028**

| latdeg | latmin | londeg | lonmin | hgtstat | year | month | day | time | nlev | code | index 6. | (latdeg latmin londeg lonmin hgtstat year month day) (5.) q_day 3. (time nlev code) (5.) | H 6. q_H 3. P 5. q_P 3.T 7.1 q_T 3. U 4. q_U 3. winddir 5. q_winddir 3. windspeed 5. q_windspeed 3. |
Upper-air data:
station UFA (28722) – Missing in IGRA, partly present in IGRA2beta,
38392 TASHAUZ – present in IGRA
Upper-air data

Table of year by month

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Analysis Variable : H

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STATISTICS FOR H, T, U, WINDIR and WINDSPEED OF STANDARD LEVELS
Upper-air data

How do we assess reproducibility?

Questions arise immediately:

Which values are to be considered “TRUE”?

Which differences from “TRUE” values are to be considered essential?

What to do with data sources that demonstrate essential differences from “TRUE” values?

Assessed were:

- temperatures on standard pressure levels,
- wind speed on standard pressure levels,
- relative humidity in troposphere

For assessment we used:

- RIHMI digitized data for 41 stations for period 1960 and before (starting sometimes in 1936), with gaps and episodic observations
- ERA-20C reanalysis reconstructed for station points
- For temperature- NOAA-CIRES 20th Century Reanalysis version 2 (20CRv2): 1871-2012 reconstructed for station points
- For relative humidity and wind speed (wind components) -NOAA-CIRES 20th Century Reanalysis version 2c (20CRv2c): 1851-2012 reconstructed for station points
- Climatologies (monthly mean and sigma values) for each of 12 months for each station of 41 list, based on data from AEROSTAB /AEROSTAS RIHMI collection, 1985-2014
Upper-air data: temperature
Use of climatological statistics for the U/A parameters, for the same 41 stations, but calculated for a later period. Together with ERA-20C and 20CRv2 reanalyses!!!

Helps us to assess how reanalyses reproduce station climatologies that were calculated from observational data (in more details – in WP4).

Upper-air data: temperature
Taylor diagrams: T1 –ERA-20C, T2-20CR v.2 – vs. RIHMI 41
Upper-air data: temperature
station 26781 Smolensk, 1938-1940
300 hPa left, 500 hPa right

Brown – 20CR v2, dark green – ERA20C
Upper-air data: temperature
station 20292 Mys Cheliusin, 1957-1960
200 hPa left, 850 hPa right

Brown – 20CR v2, dark green – ERA20C

Polar stratosphere overcooled in 20CR
Upper-air data: wind speed
Upper-air data: wind speed
station 20292  Mys Cheliuskin, 1957-1960

Monthly STD in reanalyses are underestimated for W, esp. in stratosphere
Upper-air data: wind speed
station 34172
Upper-air data: relative humidity

Myss Chelyusquina

Sverdlowsk

Saratov

Tashkent
Upper-air data: relative humidity station

Brown – 20CR v2, dark green – ERA20C
Conclusions

Reproducibility by ERA-20C and 20CR v.2 was assessed based on 41 stations early data and on 41 station climatology.

For monthly STD values: STD’s for T, and RH agree pretty well. No persistent shifts. But: Monthly STD in reanalyses are underestimated for W, esp. in stratosphere.

For monthly mean values:
- T: In 20CR v.2 polar stratosphere is essentially overcooled, polar troposphere is overcooled as well, but less. Both reanalyses and RIHMI data are highly correlated.
- W: differences are more essential, but no obvious shifts.
- RH: essential differences between all values, low correlations, and persistent shifts are hardly detectable.

The QCd data were provided to ERA CLIM2.
Deliverable 4.5 will be uploaded within this month.

Looking forward to obtain access to reanalyses that used rescued UA data to assess effects from the inputs of UA data!
A paper at WCRP Int. Reanalysis Conference.

Brown – 20CR v2, dark green –ERA20C.
Thank you for attention!