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Understanding and correcting the Up erroneous signal in GR2 IGS series

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The CNES-CLS IGS Analysis Center has participated for its first time to the $REPRO_2$ IGS reprocessing campaign in order to participate in the IGS combined product for a new ITRF realization. Preliminary comparisons between the different ACs contributions highlighted an anomalous behavior of GR2 CNES-CLS solution. The daily global RMS of the station coordinates difference exhibited a spurious annual signal on the Up and North component of respectively 6 and 2 mm.
We first investigated if any specific option in terms of parameter or model in our processing could explain such difference. For example we quantified the impact of using time-variable-gravity field models (instead of static), of using FES2012 instead of FES2004 oceanic model, of changing the cut-off elevation angle. Even if these tests remain instructive, none of them could explain the anomalous signal.
We finally discovered an error of parameterization of the GPT2/GMF2 tropospheric model affecting the full reprocessing effort: the constant atmospheric pressure option (without taking into account seasonal terms) has been considered. As a consequence, the hydrostatic tropospheric a priori correction to the GNSS measurements couldn't be totally compensated by the wet tropospheric parameter estimated a posteriori.
After confirming that this error was the major reason of our problem, we investigated if an a posteriori correction could be applied to the station coordinate series. One full year of data has been reprocessed again using an identical configuration except the consideration of a variable atmospheric pressure from GTP2 model. For each station, the coordinate comparison between the new solution called GR2P and the initial GR2 one clearly shown a smooth "annual" function. As the difference between a constant and a variable atmospheric pressure in GPT2 model is stationary from one year to the next, we concluded that this station specific function is also stationary and that it could be applied to full solution.
This presentation summarizes the results of our different investigations in understanding and correcting the erroneous signal affecting the GR2 solution.