

Session 4

Validating Geodetic Time Series

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In general, validating geodetic time series can be accomplished through repeatability studies, intercomparing different solutions, comparing with independent data sets, and fitting to observations. Criteria for judging the validity of time series can be measures of the goodness-of-fit such as the rms residual and correlation, or residual power and coherence. However, to enable the validation of different time series, they should all have similar features. For example, the values in the different time series should be estimates of the same quantity and the estimates should be given at the same epoch. The issues encountered in validating geodetic time series are discussed here with examples being drawn from our experience in validating EOP series. Rather than discussing specific approaches to validating geodetic time series, the focus of this discussion is on issues that limit our ability to do the validation.

While the Combination Pilot Project requires unconstrained solutions to form the final combinations, constrained solutions are still required to evaluate the series being combined as well as to evaluate the resulting combined series. Constrained solutions are also needed to satisfy the requirements of customers who want to use series from individual techniques but who do not want to invest in developing the procedures necessary to apply the constraint themselves. It is therefore recommended that technique services continue to provide constrained EOP solutions as well as unconstrained solutions.

If values in different time series are given at different epochs, then they need to be interpolated to a common epoch before they can be intercompared. But interpolation introduces errors. If the purpose of the validation activity is to judge the accuracy of the time series, then introducing errors into the series by interpolating the values should be avoided. Of the currently available intratechnique combined EOP series, the values of the IGS and ILRS combined series, like those of the DORIS series from IGN/JPL, are given at noon. However, the EOP values of the constrained version of the IVS combined series are given at midnight. The need to interpolate the IVS combined EOP values to noon in order to compare them to the independent IGS, ILRS, and DORIS series will adversely impact the accuracy assessment of the IVS combined series. It is recommended that technique services provide their estimates at a common, mutually agreed upon epoch such as noon in order to facilitate their intercomparison.

Comparing geodetically observed to modeled excitation can be a stringent test of EOP measurements. But the right measurements must be available. Models provide predictions for the change in the length-of-day and polar motion excitation. Thus, observations of the length-of-day and polar motion excitation must be available in order to compare them to the model predictions. Unfortunately, not all technique services are providing length-of-day and/or the polar motion rate estimates that are needed to construct the polar motion excitation values. For example, neither length-of-day nor polar motion rate estimates are included in the constrained version of the IVS combined series. And while the ILRS

combined series does include lod estimates, it does not include polar motion rate estimates. While polar motion rate can be numerically estimated from the polar motion values, this approach introduces numerical noise into the derived excitation series and should be avoided. It is recommended that technique services additionally provide lod and polar motion rate estimates whenever possible.

Summary of Recommendations

1. It is recommended that technique services provide both constrained and unconstrained EOPs.
2. It is recommended that technique services provide EOPs at a common epoch such as noon.
3. It is recommended that technique services provide lod and polar motion rate estimates.

These recommendations are to be taken in the context of validating geodetic time series. There may be competing issues that take precedence and make it difficult for some techniques to implement these recommendations. For example, since VLBI does not observe continuously, in order not to degrade the accuracy of the VLBI EOP products, it may be more important to provide the EOPs at, say, the midpoint of the observation interval rather than at some regular epoch like noon.