Geophysical Research Abstracts
Vol. 17, EGU2015-979, 2015
EGU General Assembly 2015
© Author(s) 2014. CC Attribution 3.0 License.

# Homogenization of atmospheric pressure time series recorded at VLBI stations using a segmentation LASSO approach

Kyriakos Balidakis (1), Robert Heinkelmann (1), Cuixian Lu (1), Benedikt Soja (1), Maria Karbon (1), Tobias Nilsson (1), Susanne Glaser (2), Julian Andres Mora-Diaz (1), James Anderson (1), Li Liu (1), Virginia Raposo-Pulido (1), Minghui Xu (1), and Harald Schuh (1)

(1) Helmholtz Centre Potsdam, German Research Centre for Geosciences (GFZ), Potsdam, Germany, (2) Technische Universität Berlin, Institute for Geodesy and Geoinformation Science, Berlin, Germany

Time series of meteorological parameters recorded at VLBI (Very Long Baseline Interferometry) observatories allow us to realistically model and consequently to eliminate the atmosphere-induced effects in the VLBI products to a large extent. Nevertheless, this advantage of VLBI is not fully exploited since such information is contaminated with inconsistencies, such as uncertainties regarding the calibration and location of the meteorological sensors, outliers, missing data points, and breaks. It has been shown that such inconsistencies in meteorological data used for VLBI data analysis impose problems in the geodetic products (e.g vertical site position) and result in mistakes in geophysical interpretation. The aim of the procedure followed here is to optimally model the tropospheric delay and bending effects that are still the main sources of error in VLBI data analysis.

In this study, the meteorological data recorded with sensors mounted in the vicinity of VLBI stations have been homogenized spanning the period from 1979 until today. In order to meet this objective, inhomogeneities were detected and adjusted using test results and metadata. Some of the approaches employed include Alexandersson's Standard Normal Homogeneity Test and an iterative procedure, of which the segmentation part is based on a dynamic programming algorithm and the functional part on a LASSO (Least Absolute Shrinkage and Selection Operator) estimator procedure.

For the provision of reference time series that are necessary to apply the aforementioned methods, ECMWF's (European Centre for Medium-Range Weather Forecasts) ERA-Interim reanalysis surface data were employed. Special care was taken regarding the datum definition of this model. Due to the significant height difference between the VLBI antenna's reference point and the elevation included in geopotential fields of the specific numerical weather models, a hypsometric adjustment is applied using the absolute pressure level from the WMO (World Meteorological Organization) stations in the vicinity of the observatory. In practice, the accuracy of providing the absolute pressure level in such a manner depends on the availability of reliable WMO stations. Hence, both, vertical and horizontal, distances serve as criteria for the selection and weighting of the WMO stations used. Including information from very distant WMO stations in the hypsometric adjustment, results in the lack of definiteness of the correction.