Analysis of non-tidal loading deformation at VLBI sites

S. Singh, J. Böhm, H. Kràsnà, O. Dikshit, N. Balasubramanian

Abstract

Very Long Baseline Interferometry (VLBI) is one of the geodetic techniques which define the International Terrestrial Reference Frame (ITRF). It requires data from multiple antennas fixed at different locations on the Earth's surface. However, the accuracy of this technique is affected by the deformation of the Earth's crust by various geophysical effects, including plate tectonics, loading from solid Earth tide, atmospheric pressure, and water mass redistributions (over land and ocean).

This study aims to compare the non-tidal loading products retrieved from different loading services such as TU Wien, ESMGFZ, International Mass Loading Service, and Uni Strasbourg. Non-tidal loading refers to the deformation of the Earth's surface caused by mass redistributions within the Earth's system, such as changes in atmospheric pressure, groundwater, and ice-sheet melting. This deformation can cause positional shifts in the VLBI sites, affecting the accuracy of the VLBI measurements. To account for the non-tidal loading effects in VLBI analysis, geophysical models are used to estimate the displacement of VLBI stations.

We present the comparison of different non-tidal loading products from different loading services in Vienna VLBI and Satellite Software (VieVS) by analysing the variation in repeatability values of baseline length and Earth orientation parameters. This study will help to determine the accuracy of the different loading products and their impacts on VLBI analysis. Overall, the study highlights the importance of accurate geophysical models and loading products in VLBI analysis. The comparison and analysis of different loading products can help to identify the most accurate and reliable geophysical models for non-tidal loading for implementation in VieVS software.

Presentation type: oral

Shivangi Singh[1], Johannes Böhm[2], Hana Kràsnà[2], Onkar Dikshit[1], Nagarajan Balasubramanian[1]
(1) Indian Institute of Technology Kanpur, Department of Civil Engineering, Kanpur, India
(2)Vienna University of Technology, Department of Geodesy and Geoinformation, Vienna, Austria
Corresponding author: shivangi@iitk.ac.in