

Rotation of the Earth measured by VLBI and the climate phenomenon ENSO

Background: The El Niño-Southern Oscillation (ENSO) is a recurring climate phenomenon that has a strong influence on weather. It involves changes in the temperature of waters in the central and eastern Pacific Ocean, that evolve in between three different phases: El Niño (warming of the ocean surface), La Niña (cooling of the ocean surface), and a neutral phase between these events. The National Oceanic and Atmospheric Administration (NOAA) regularly monitors ENSO by combining both oceanic and atmospheric variables in the Multivariate ENSO Index (MEI). MEI time series are publicly available for the period 1979 to present.

Project description: *The objective of this thesis work is to study the influence of such major climate phenomenon on the Earth's rotation, and in particular its velocity, thus the length-of-day (LOD). We will use the LOD time series measured by the Very Long Baseline Interferometry (VLBI). VLBI is a radio astronomy technique which observations are used to estimate Earth Orientation Parameters, including the LOD.*

Method: The relation between LOD and ENSO has been studied in various publications using simple decompositions of the LOD time series or the Singular Spectral Analysis. This proposed work focuses on the study of the relation LOD vs. MEI using a different statistical tool, e.g. wavelet-based semblance analysis, and on the determination of potential delays between the components of LOD and MEI.

The students should have an interest in Earth science and applied mathematics with an emphasis on time series analysis, and have some basic knowledge in Matlab and/or python.

Target group: TKTFY, TKELT, TKDAT, TKGBS och GU-fysik.

Group size: This project is suitable for one or two groups of 3-4 students.

NOTE: *the report can be written in Swedish. If anyone from TKTFY (F) is in the group, the report must be written in Swedish.*

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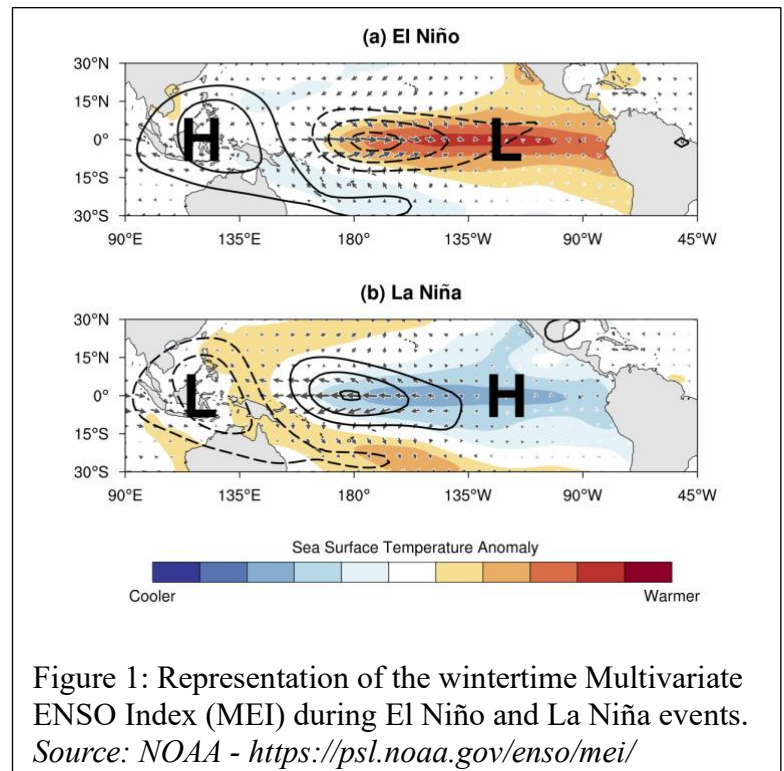


Figure 2: One of the three telescopes at the Onsala Space Observatory that routinely participate in VLBI experiments.