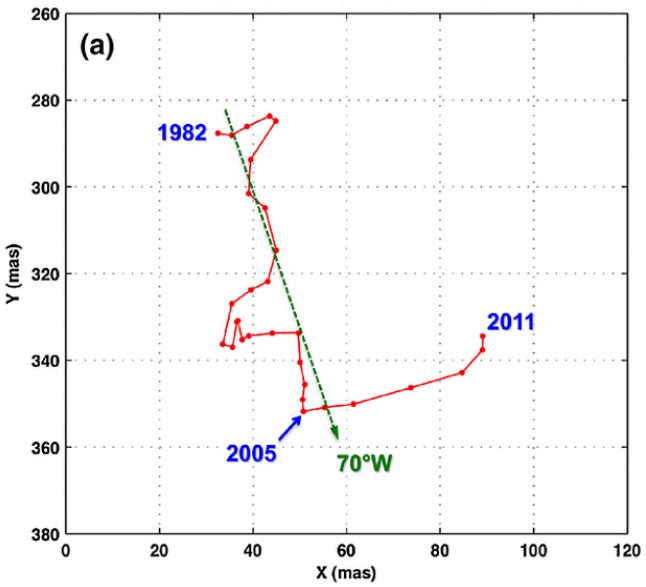
Current topic for a Master's Thesis

Ice mass changes of inland glaciers and its impact on Earth rotation: A simulation study

The redistribution and motion of masses in the Earth system causes variations of Earth rotation that are being observed by space-geodesy with very high accuracy. The analysis of the observed variations of Earth rotation in terms of contributions from individual geodynamic processes is a great challenge. While relatively large contributions of atmospheric and oceanic processes are quite well understood, the relatively small contributions due to melting land ice are still very uncertain. But at the same time these contributions are of great interest as they carry information about global impacts of global change. As ice melt is an ongoing process, we expect in particular an impact on the long-term trend of polar motion. But its quantification is difficult as reliable models of glacier mass changes are lacking on global scale.



Trace of the yearly mean pole positions (Chen et al. 2013). After around 2005 the pole position began to drift towards the east mainly due to ice mass loss and related sea level

In the frame of the master's thesis a simulation study shall be performed in order to analyse the potential impacts of different inland glaciers (beside the Greenland and Antarctic ice sheets) on Earth rotation, depending on their size, their observed rate of change and their geographical location.

Tasks:

- Development of a software tool for the simulation of ice mass changes in terms of water equivalent for different inland glaciers
- Transformation of the simulated mass changes into variations of Earth rotation (Euler-Liouville Equation)
- Systematic analysis of the current and potential future impacts of individual inland glaciers on Earth rotation
- Validation of the results by comparing them with external studies.

Literature:

Chen, J.L., et al.: Rapid ice melting drives Earth's pole to the east. Geophysical Research Letters, 2013.

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