Masters Defense by Markus Tritscher

Title: Detecting Forest Fires from Renland Ice Core Data

Abstract:

The thesis deals with a data analysis with data derived from a continuous measurement of a 584 meter long ice core from a deep drilling session on a peninsula in eastern Greenland on a place called Renland. The ice cores were cut on site in 55cm long pieces, transported to Bremerhaven where they were cut into sections and shipped to Copenhagen where one section was melted on the whole length and analysed in a Continuous Flow Analysis (CFA) system.

As temperatures are rising in many parts of the world and thus extreme events such as draughts and lightning storms are expected to be more common and more severe, the impact of the climate on fire activity is of high importance as not only ecosystems, but also human health from pollution plumes and direct danger on towns or cities that have been built in fire prone areas are threatened by forest fires. According to (Jacobson, 2014) biomass burning accounts for 18 percent of all human generated carbon emissions.

For this specific thesis black carbon as a direct pollutant of fossil fuel burning together with ammonium as a proxy for biomass production is used to identify past forest fire events in the melt data. It is expected to find only forest fire traces from North America due to the predominant wind pattern arriving on the south eastern coast of Greenland.

Within this research natural borders are given by the quality of the data. The time period for investigation done here dates back to 1300 years before present, with a few exceptions that go further back in time. In theory forest fires should occur when both, ammonium and black carbon show a high peak in the signal. In the data we find many common peaks among them, however most of the peaks cannot be accounted as forest fire because of simultaneous melt layers also causing peaks in BC and ammonium.

The data is also compared to other findings (forest fire history and other ice core data) throughout this thesis and similarities can be found in long term trends as well as for distinctive fire events.