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Steps towards a continuous methane concentration record back to 100 kyr BP

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Since the early 1980's methane concentrations are measured from ice cores. Air is extracted from individual ice samples by dry or wet extraction techniques and traditionally measured by gas chromatography. Over the past decades a CH_4 record has been achieved with sample resolutions of down to decades and typical uncertainties of $\pm$10 ppbv. Methane variations on time scales of decades to millennia show important correlations with climate proxies in ice cores, with remarkable correspondence between stable isotope records from Greenland ice cores and methane concentrations during the last ice age. Recent developments allow measurements of CH_4 concentration directly on the drill site with very high resolution. In the frame of the NEEM (NW Greenland) ice core drilling project we measured methane concentration with a continuous flow analysis (CFA) system. The air in the CFA melt stream is extracted with a hydrophobic membrane unit, dried, and routed through two optical systems in series. The resolution of the methane data is unprecedented with excellent precision. However, the accuracy of the data is not satisfactory due to solubility of the gas in the melt stream and calibration issues. We combine precise off line measurements from several Greenland ice cores with the on line NEEM CH_4 record in order to obtain an improved Greenland CH_4 composite record. Further we establish a gas time scale for the NEEM ice core by synchronizing the CH_4 records.