GEOSummit Baseline Measurements: Results and Interpretations of Year-Round Measurements

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Long term measurements of the Arctic atmosphere and surface snow provide insight to the relationship between aerosol and snow chemical compositions. Current research activities at the Summit Greenland Environmental Observatory (GEOSummit) include high temporal resolution year-round measurements of DRUM aerosol size and S-XRF elemental composition, snow accumulation and spatial variability, IC and/or ICP-MS trace element measurements of surface snow and snow pits, and other meteorological and snow properties. Year round snow samples allow for a better understanding of the magnitude and timing of seasonal cycles in aerosol elemental concentrations which are deposited and preserved in the snow pack. Several elements exhibit distinct seasonal timing of maximum concentrations found in surface snow samples (e.g., sea salts are largely deposited in the winter with dust predominantly deposited in the spring). Due to the high temporal sample resolution, unique events that transport dust or pollution from North America and/or Asia can be identified. The source regions of these unique events are identified using the Lagrangian Particle Dispersion Model (LPDM) FLEXPART. In addition, snow accumulation rates were measured over the snow sampling period, thus aiding the evaluation of wet and dry deposition as well as quantifying the inter-annual variability. Comparisons between surface snow and continuous ice core measurements indicate that the seasonal cycle of many of the elements are well preserved in ice cores, thereby allowing for better understanding of past atmospheric conditions reconstructed from the elemental records. Longer term records are necessary for comparisons to geophysical processes with multi-year periodicities (e.g. NAO, AMO, etc). Future plans include proposing to continue the Summit activities for another five years to better characterize annual to decadal variability in snowfall, elemental concentrations in aerosols and snow, and links with atmospheric circulations and transport.

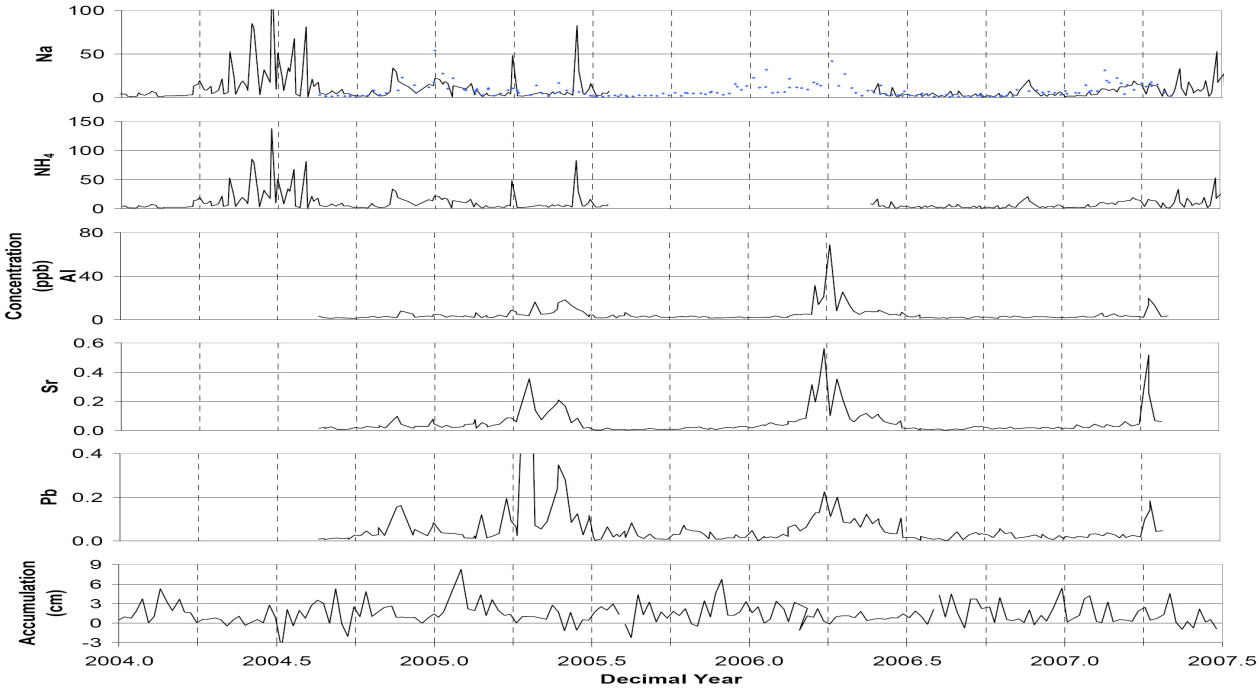

Figure 1. Example Subset of IC, HR-ICPMS and Accumulation Datasets.