To understand the role of bio-organic matter contributions to atmospheric chemistry and physics, we took part in the international OASIS field campaign (2009) in Barrow, Alaska. We took samples and analyzed snow and air, focusing on a wide range of C2-C6 volatile and semi-volatile organic compounds, as well as bio-organic matter using several complementary sampling methods and state-of-the-art analytic techniques, as well as DNA analysis methods. OASIS campaign aimed at understanding air-surface chemical interactions in the Arctic and their evolution in different climate scenarios. One of the main research themes was quantitative and reliable determination of chemical and biological fluxes to and from ice and snow surfaces, as a function of the nature of the surface and other relevant atmospheric conditions. We will describe our observations and results of field and laboratory experiments. We will discuss the advantages and limitations of selected techniques, for bio-organic compounds analysis in environmental matrices. We will also present the fluxes between snow/ice-air interfaces at different environmental conditions, and explore their significance within the context of chemistry of the Arctic lower troposphere.