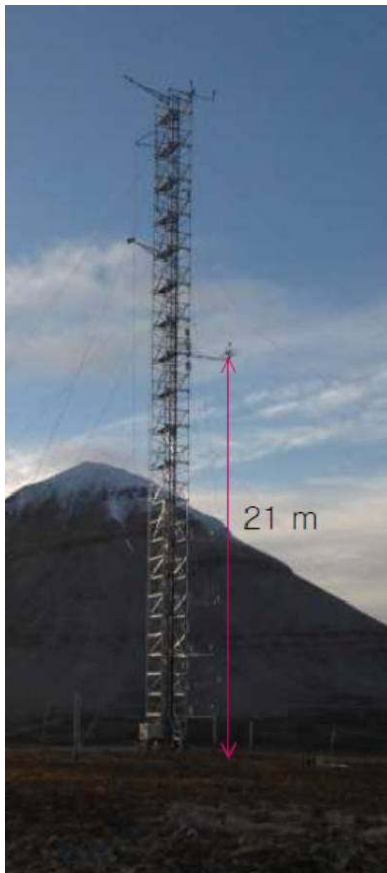


Observation Platforms at Dirigibile Italia

Amundsen- Nobile Climate change Tower (CCT)



The 33 m high Amundsen-Nobile Climate Change Tower (CCT) has the possibility to host and operate many instruments, with possibility to have remote control of measurements and real/near-real data flow. Research implemented aim to deeply investigate energy and radiation budgets in the surface layer, ABL dynamics and stability, exchange fluxes (heat, momentum, chemicals) at the atmosphere-land interface, and perform closure studies of the energy budget at the surface and connect in a better way the most part of processes involved in

COMPLETE CCT INSTRUMENTATION SETUP

- K&Z CNR 1 net radiometer [33 m]
- K&Z CM11 and CGR4 upwelling first class radiometers [25 m]
- Young propeller anemometer [33m, 10m, 5m and 2m]
- Vaisala HMP45 thermo-hygrometers [33m, 10m, 5m and 2m]
- Campbell CSAT3 sonic anemometers [21 m]
- Campbell EC150 fast hygrometer [21 m]
- CH4 and CO2 open path analyzers [21 m]
- CRDS inlet for gas measurements [21 m]
- Gill R50 Solent sonic anemometer [7.5 m]
- Campbell Kh-20 fast hygrometer [7.5 m]
- Gill R50 Solent sonic anemometer [3.7 m]
- Campbell Kh-20 fast hygrometer [3.7 m]
- IR120 infrared sensor for snow skin temperature [5m]
- SR50 sonic range sensor for the snow height [5m]
- Flux plate at the interface soil-snow [at surface]
- PT100 in the snow layer and into the ground [15 , 5, -5, -15 cm]



Gruvebadet Aerosol Laboratory



The Gruvebadet laboratory in Ny-Ålesund has been equipped with a series of instruments aimed measuring physical and optical properties of aerosols at ground level, identify chemical markers of environmental response to climate changes and anthropogenic impact, characterize log-range transport processes and transformation mechanisms of chemical species associated with the aerosol in the Arctic region, study air-snow processes and interactions.

The laboratory has a large space to host instruments and support field campaigns



Aerosol sampling

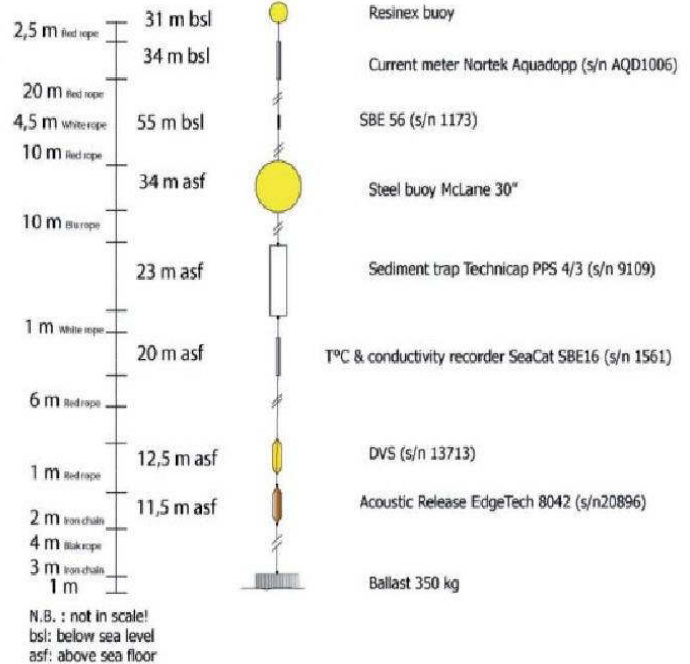
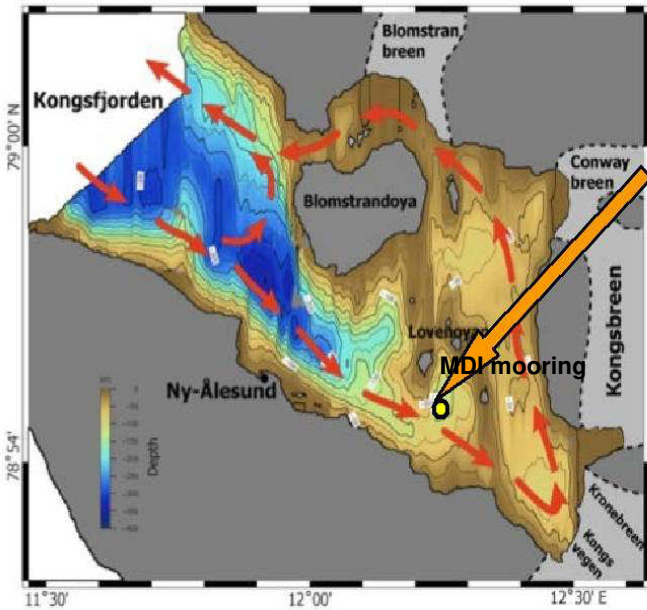
- I. Low Volume PM10 impactor for ions and metals determination (24-h resolution);
- II. Low Volume 4-stage (<1, 1-2.5, 2.5-10, > 10 um) impactor for ions and metals determination (4-day resolution);
- III. Low Volume 12-stage (0.045 – 8.5 um) impactor for elemental (PIXE) analysis (4-day resolution);
- IV. Medium Volume PM10 impactor for Heavy Metals and Pb isotopic ratios determination (4-day resolution);
- V. Low Volume PM10 impactor for EC/OC determination (4-day resolution);
- VI. Medium Volume PM10 impactor for selected organic compounds analysis;
- VII. Particle size distribution measurements (106 size classes: 6-500 nm by SMPS; 0.5 – 20 um by APS); 10-minute resolution.
- V. aerosol absorption coefficient by 3-wavelengths PSAP

Mooring Dirigibile Italia (MDI)

A permanent mooring have been installed in the inner part of the Kongsfjorden with the aim to investigate proprieties of the water passing across strait, bottom depth and measurable sedimentation rates. Mooring Dirigibile Italia (MDI) has been deployed in September 2010 and is serviced and deployed again 1-2 times per year.

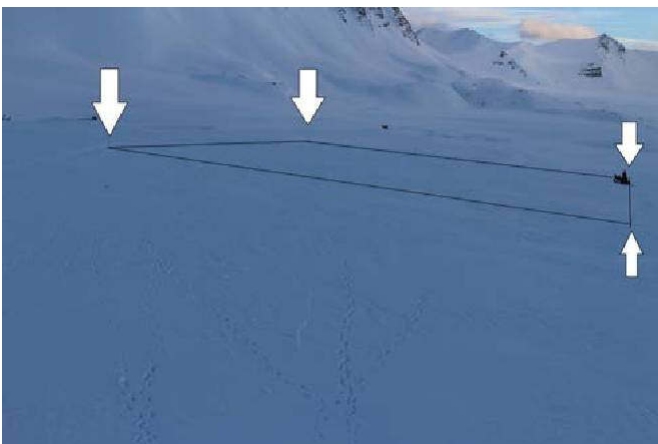
MDI allow to continuously monitor variations of thermohaline characteristics of: a) surface water by the glacier melting; b) intermediate water by variable intrusion of Atlantic-type water and c) bottom water locally produced during winter. Moreover to collect information on sedimentary processes and interactions with benthos communities, glaciers and enhanced coastal runoff;

The list of measuements include: - water temperature @ 37, 58, 69, 88 and 93m - current speed and direction @ 37m and 93m - salinity @ 88m - mass and particulate organic carbon fluxes @ 85 m



Calm Grid monitoring site

The monitoring of permafrost and active layer conditions: characterization of snow coverage, vegetation and the snow conditions is performed at the CALM GRID site close to the CCT. The measurements consist in measure with a snow probe in correspondence of each of the 36 nodes of the grid within an area of 50x50 m with a span of 10 m. A digital snow camera (installed during SSF-SFG project SMAC) collects images of the surface seasonal variation all over the year.



CALM GRID area seen from the CCT and picture of the surface condition in October 2014
1.- Ongoing Monitoring

CONTINUOUS OR ON SEASONAL BASIS LONG-TERM ACTIVITIES

Atmosphere/soil/ ecosystems (implemented between 2008-2014)

- 1- Meteorological profiles up to 34 m at CCT.
- 2- Temperature profile into snow layer and heat flux at the soil interface.
- 3- Turbulence vertical profiles using three sonic anemometer (heat and momentum flux, TKE).
- 4- Radiative budget at the surface , broadband albedo.
- 5- Gaseous fluxes (CO₂, CH₄, H₂O) in cooperation with KOPRI
- 6- Aerosol Characterization at Gruvebadet: size distribution, chemical speciation of size segregated samples collected with PM10, 4-stage and 12-stage impactors), spectral absorption properties.
- 7- Spectral UV radiation and UV doses with high narrow band radiometer UV-RAD.
- 8- Permafrost and active layer conditions: characterization of snow coverage, vegetation

Marine (since Sept 2010, inner Kongsfjord)

- 9- Variations of thermohaline characteristics of: a) surface water by the glacier melting; b) intermediate water by intrusion of Atlantic-type water and c) locally winter produced bottom water
- 10- Temporal variability of particle fluxes and compositions due to the combined effect of the biological productivity, glaciers retreat and enhanced coastal runoff;

ON SPRING/SUMMER FIELD CAMPAIGN BASIS

Atmosphere/ecosystems

- 11- Profiling with tethered balloon aerosol properties in the ABL up to 600-1000 m.
- 12- Characterization of snow coverage (morphology and composition near CCT and/or Gruvebadet Lab)
- 13- CO₂ fluxes measurements of the analysed vegetation species/ecosystems and monitoring of the phenology (on the CALM grid).

Marine (inner Kongsfjorden)

- 14 Hydrological survey: A suite of 30-40 CTD stations are annually-repeated for monitoring the variability of interaction between glacier melting, fjord and ocean waters.

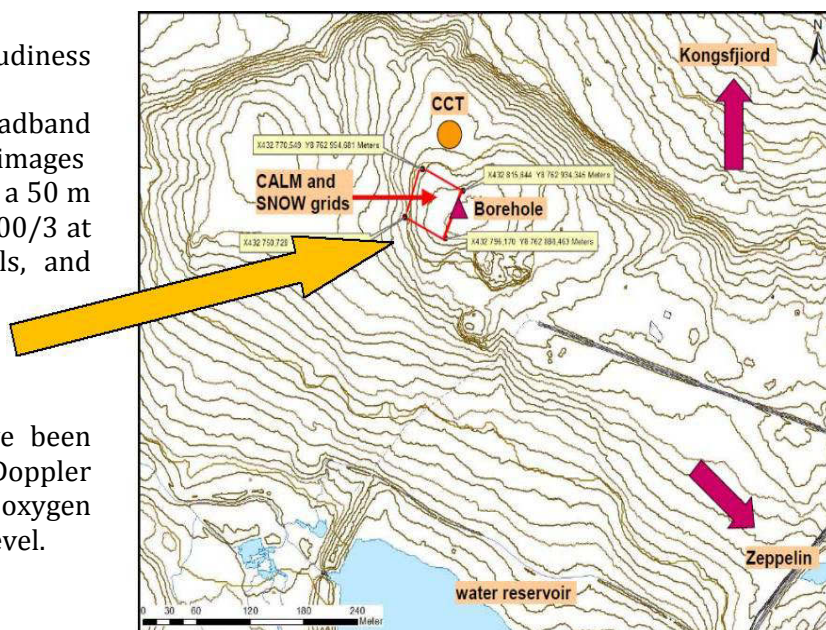
2 –Monitoring Activities Implemented since 2015

Atmosphere/ecosystems

- 1- spectral albedo measurements and cloudiness observation by sky cam from the CCT
- 2- vegetation status thanks to spectral/broadband albedo measurements and digital camera images
- 3- Permafrost temperature profile thanks to a 50 m deep borehole, equipped with 22-24 PT100/3 at different depth according TSP protocols, and improving measurements at the surface.

Marine (inner Kongsfjorden)

- 4- the two single-point current-meters have been substituted by an ADCP (Acoustic Doppler Current Profiler). An optical dissolved oxygen sensor will be added at the near-bottom level.



position of the 50 m deep borehole realized in spring 2015 with respect CCT and CALM grid area