

# GLACIODYN – The dynamic response of Arctic glaciers to global warming

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## Project summary

The project is a Norwegian contribution to IPY Activity 37 *Glaciodyn*. The goal is to investigate the role of ice dynamics in the response of Arctic glaciers and ice caps to global warming, to improve prediction of future changes and their impact on freshwater fluxes to the ocean and thus global sea level. The key aims of *Glaciodyn* are to (i) *to apply optimized observational techniques in glacier monitoring*, and (ii) *develop robust, predictive models that include key dynamic processes*. The inclusion of ice dynamics in predictive models would represent a significant advance from current mass balance models of future response. Special focus will be on interactions between surface processes and dynamics (e.g. the influence of meltwater supply on ice velocities) and calving glacier dynamics. The coupling sliding/hydrology will be studied directly in a subglacial laboratory. Under a warming climate, some glaciers will transform from cold to polythermal, or from polythermal to temperate. It is proposed to study the effect of such transitions on glacier dynamics and rates of adjustment of glacier geometry. *Model development* will be conducted in parallel with the observational programs. A key question is to what extent a warmer climate may change both surface processes (snow accumulation, internal refreezing, superimposed ice and ablation) and dynamics. We propose to address these issues in a set of complementary glacier observation and modelling programs. Predictions of future mass balance and dynamic response require boundary information about the thermal structure of the ice, the surface mass balance, meteorological data, surface and bed topography and current flow. These points will be the main focus for the field and remote sensing investigations. Studies will be conducted at four sites, all target glaciers in *Glaciodyn*, representing the range of glacier types in arctic Norway: 1) Austfonna, a large ice cap in Nordaustlandet, Svalbard; 2) Kronebreen/Kongsvegen, contrasting calving glaciers in West Spitsbergen, Svalbard; 3) Langfjordjøkelen, a temperate small ice cap in Northern Norway; 4) Engabreen, an outlet glacier with a subglacial laboratory at the Svartisen ice cap, Northern Norway.