PROJECT TITLE: Marine Biogeochemistry and Surface Exchange of Climate Active Gases in a Changing Arctic System (ArcticNet NCE)

Investigators: Tim Papakyriakou (CEOS, UM); Brent Else (Calgary)

Research Team: Maurice Levasseur (Laval), Lisa Miller (IOS), Alfonso Mucci (McGill), Søren Rysgaard (UM), Nadja Steiner (DFO, CCMA), Helmuth Thomas (Dal), Philippe Tortell (UBC), Huixiang Xie (UQAR)

Objective/Goals:

1. To assess climate-active gas transfer and ocean acidification in the Canadian coastal Arctic and monitor potential climate change-effects on trace gas cycling;
2. To elucidate the underlying processes controlling the transfer of climate-active gases and ocean acidification; and
3. To forecast future gas exchange and ocean acidification and to identify feedbacks to global climate change.

Strategy:

1. Evolution of previous projects: ArcticNet, IPY-CFL, CASES
2. Final phase: synthesize existing information & strategically fill remaining observational and data gaps (largely Amundsen- & ice camp-based)
3. Three integrated lines of investigation: (1) monitoring, (2) process studies, and (3) biogeochemical modeling
4. Geographic domain extends from S. Beaufort (w/Canada Basin), CAA, to Baffin Bay (Kane Basin, Kennedy Channel) and Hudson Bay
5. Water column CO_2 system; DMS and precursors; dissolved trace gases (CO_2, CH_4, N_2O); surface exchange; water mass tracers and trajectories; sea ice biogeochemistry

PROJECT TITLE: Marine Biogeochemistry and Surface Exchange of Climate Active Gases in a Changing Arctic System (ArcticNet NCE)

Investigators: Tim Papakyriakou (CEOS, UM); Brent Else (Calgary)

Challenges: HQP recruitment; technological development (e.g., in-situ sensors); temporal and spatial coverage (e.g., freeze-up, cruise tracks); manipulations; budget

Deliverables:

1. quantification of trends towards ocean acidification, and identification of the associated risks;
2. an assessment of climate-active gas (CO_2, CH_4, N_2O, DMS) cycling, distribution, budgets, and stressors;
3. identification of contributions from river and coastal runoff to carbon budgets and acidification; and
4. BGCM – process parameterization; validation; projections: carbon system, acidification, and exchange/emission budgets

Stakeholder Engagement:

1. Networks: GEOTRACES & NETCARE, Arctic Science Partnership (Denmark and Greenland), AMAP
2. Government: DFO, EC (CCCma), AADNC (AMAP and NCP)
3. Industry: Manitoba Hydro
4. Community outreach & knowledge transfer coordinated through ArcticNet

Future Outlook: access to icebreaking fleet after ArcticNet(?); CHARS?; MEOPAR(?); greater synergies with Europe(?), other?