Carbon Dynamics Working Group

Sue Natali (Chair), R. Commane, M. Engram, J. Fisher, J. Gamon, S. Goetz, G. Grosse, F. Huemmrich, J. Jastrow, T. Jorgenson, J. Kimball, P. Lindgren, M. Mack, F. Meyer, C. Miller, M. Moghaddam, B. Munger, N. Pastick, C. Potter, D. Risk, B. Rogers, T. Schuur, R. Striegl, S. Tank, S. Veraverbeke, K. Walter-Anthony, J. Watts, K. Wickland, E. Wilson, L. Wirth, S. Wofsy

Field & Other Activities

- **Continuous lake water quality and dissolved CO_2 sensors deployed** at two lakes (Fig. 1), and **lake chemistry and fluxes measured** at 20 lakes in Yukon Flats, AK (Fig. 5, *Striegl-01*)
- **Stream and permafrost seep carbon chemistry, flux, and water flow network** established at ~ 8 catchments in AK (*Striegl-01*)
- **Remote sensing analyses of lake distribution and color** and of **vegetation and ground surface conditions** at and near AK measurement sites (*Striegl-01*)
- **Regional CO_2 fluxes predicted over past 15 years for the ABoVE domain** using MODIS vegetation index combined with NASA-CASA model; ABoVE CASA Research Note (*Miller/Potter*)
- **Eddy covariance flux retrievals** at Barrow, Atqasuk and Ivotuk (*Kimball/Oechel*). **Eddy covariance CO_2 flux data collected** from towers across ABoVE domain (*Gamon-01*)
- **Analysis of MODIS, meteorological, and CO_2 flux data from several flux towe**r sites within the ABoVE domain (*Gamon-01*)
- Application of the **MODIS-derived Chlorophyll:Carotenoid Index** (CCI) as an indicator photosynthetic phenology, including spring activation; manuscript in review (*Gamon-01*)
- Data from > 14 eddy covariance sites being used to calibrate/ validate a **remote sensing based Terrestrial Carbon Flux model,** output daily at a 1-km resolution (*Kimball-04*)
- **Continuous year-round soil CO_2 flux systems, temperature and moisture probes deployed** and **vegetation/soil surveys** conducted at 10 sites across Alaska (Figs. 2,6; *Natali-01)*
- **Pan-Arctic non-growing season respiration dataset** compiled**;** synthesis presented at ICOP (Fig. 3; *Natali-01)*
- **Bubble surveys completed for SAR validation** (*Meyer-01*)
- Historical optical images rectified for several sites**; historical and current lake mapping completed** at several locations (*Meyer -01*)
- **Historical methane emissions from thaw lakes quantified**; Walter Anthony et al. 2016 (Fig. 4; *Meyer-01)*
- **ABoVE Fairbanks logistics office** used by several teams for training, staging, truck and equipment, and storage

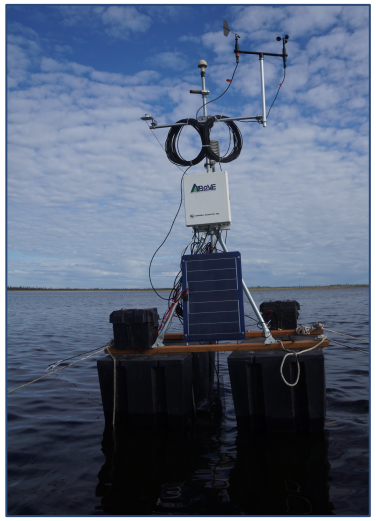

Fig 1. Lake chemistry monitoring system (Striegl)

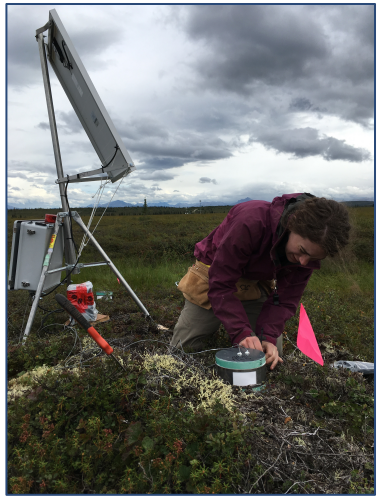

Fig 2. Installation of soil respiration, temp. and moisture system (Natali)

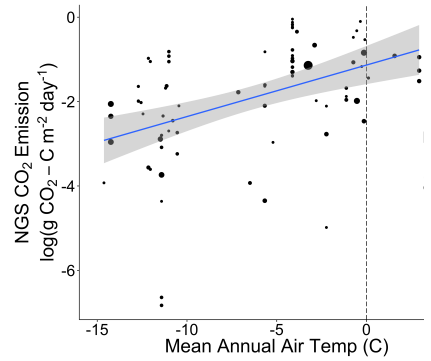

Fig 3. Pan-Arctic nongrowing season (NGS) CO_2 flux dataset (>80 study sites) will be used to examine drivers of NGS CO_2 emissions (e.g., MAAT), scale NGS fluxes, and for model cal-val (Natali-01)

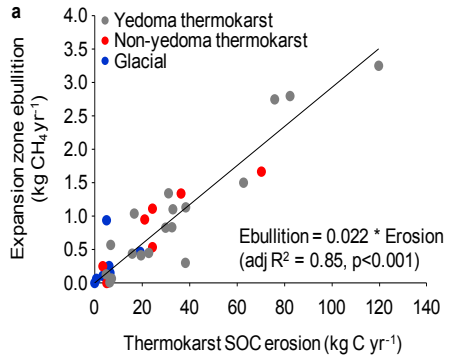

Fig 4. Relationships between mass of soil organic carbon input to thermokarst-affected lakes and lake methane emissions. *From Walter Anthony et al.* (2016)(*Meyer-01)*)

Education, Outreach & Stakeholder Engagement

- Several new **postdocs** hired and **graduate students** working on a number of CDWG projects (Fig 5)
- **Collaboration with USFWS and the Western Boreal LCC**; field support from Yukon Flats National Wildlife Refuge (*Striegl-01*)
- **Collaboration with ARCUS to establish STEM outreach with remote Alaska Native communities**; focused on validation of NASA/ABoVE remote sensing data products and collection of thaw depth, snow cover, soil moisture, soil temperature, and land disturbance data (Kimball-04)
- **Coordination of data sharing with the NPS Inventory & Monitoring Networks** in preparation for upcoming airborne activities (Kimball-04)
- Working to **engage Canadian colleagues** in ABoVE activities (Kimball-04).
- Vegetation and thaw depth **data sharing with Yukon Delta National Wildlife Refuge** (Schaefer-05)
- Field work with high school teacher and students (Fig. 6); **integrating ABoVE CO_2 flux data into high school curriculum** (Natali-01)
- Presentation about lake **CH4 emissions for middle school students** in UAF's AK Summer Research Academy (Meyer-01)
- Methane lake emissions research featured in social media and many **print, radio and television interviews** (Meyer-01)

Fig 5. USGS scientist, Dornblaser, and graduate student, Johnston, measue lake CO_2 & CH_4 concentrations (Striegl)

Fig 6. Student measures organic layer depth at Nome Creek forest (Natali)