

Statistical Relation of Abiotic Factors to Methane Emissions in Arctic Environment, Alaska

Authors : Vasudha Chaturvedi, Mauro Guglielmin, Nicoletta Canone, Chiara Casiraghi, Francesco Griforni, Lorenzo Tonin, Silvia Piconne, Ilaria Bonfati, Filippo Caccia, Stefano Ponti

Abstract : The study explores the complex interplay between abiotic factors and methane emissions in Arctic environments. It highlights the challenges in understanding these relationships across different vegetation communities and seasons, considering the influence of multiple drivers. In the spring and early winter of 2023, we investigated net methane fluxes and 55 environmental parameters at three distinct sites in Alaska representing wet tundra, tussock, and dry heath using closed chamber techniques. Each site underwent three measurement cycles over consecutive days. Our findings reveal that tussock sites exhibited the highest methane emissions (ranging from 17 to 44 nmol m⁻² s⁻¹), followed by wet tundra (3 to 38 nmol m⁻² s⁻¹), while the dry heath consistently consumed methane across all seasons (-1.2 nmol m⁻² s⁻¹). Diurnal flux patterns at tussock sites peaked in the afternoon towards beginning of winter season, with correlations observed between fluxes and water content at 20 cm depth across all sites, and additionally with ground surface temperature (GST) temperature and water content at 0-60 cm depth at one site. Wet sites displayed higher correlations with GST up to 60 cm depth. These findings underscore the importance of considering site-specific dynamics and multiple environmental variables in understanding methane emissions from Arctic ecosystems.

Keywords : climate change, cryosphere, methane fluxes, soil, ground temperature

Conference Title : ICGG 2024 : International Conference on Geology and Geophysics

Conference Location : Santiago, Chile

Conference Dates : September 16-17, 2024