Seminar “Physics and Chemistry of the Atmosphere”,
Institute of Environmental Physics (IUP), Univ. Bremen
Date: 30-May-2025, 14:15
Place: Building NW1, Room S1360

# Satellite-based Cloud Sensitivities and Retrieval Techniques

Kameswara Sarma Vinjamuri (IUP)

Accurate cloud phase classification in the near-infrared is complex due to the overlapping radiative behavior of water, ice, and mixed-phase clouds. It is essential to have accurate cloud phase information for cloud retrievals.

1.61 µm and 2.25 µm correspond to vibrational overtone and combination bands of water and ice, which are particularly sensitive to their absorption differences. These differences are highly effective for distinguishing cloud phases. The 0.87 µm band, dominated by scattering, provides additional phase sensitivity due to its angular dependence. Mixed-phase clouds, containing both liquid water droplets and ice crystals, are particularly common in the Arctic. To date, there has been no systematic identification and retrieval of mixed-phase clouds from passive satellite-based observations over the Arctic. In this study, we develop a physically based index combining radiances at these three wavelengths to capture both spectral absorption and directional scattering differences. This composite index facilitates the improved identification of cloud phases, particularly in mixed-phase clouds where both water and ice coexist. We further retrieve cloud optical depth and effective radius using the optimal estimation method for SLSTR. For mixed-phase clouds, the ice fraction, defined as the ratio of ice to total optical depth, is retrieved using SLSTR dual-view radiance contrasts at 0.87 µm.