Seminar

COMPS Centre for Molecular Water Science

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Zoom Virtual Meeting:

https://tuhh.zoom.us/j/82631283465 Meeting-ID: 826 3128 3465 Password: 978444



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Astroparticle glaciology: How the extraordinary optics of glacial ice enables the IceCube Neutrino Observatory

The IceCube Neutrino Observatory is a curious telescope. It instruments one cubic kilometer of deep, glacial ice at the geographic South Pole using 5160 downward-facing photosensors. Using this instrumentation, it detects Cherenkov light emitted by charged relativistic particles resulting from neutrino interactions. The inference of particle direction and energy from the recorded light patterns requires a detailed understanding of the optical properties of the ice. Thus, properties ranging from the impurity deposition over 100 000 years of climate history to the flow dynamics of ice over the underlying bedrock topography need to be accounted for.

In this talk I will introduce the extraordinary optical properties of pure and naturally occurring frozen water [1] and how these can be measured in situ using pulsed light from co-deployed LEDs. In addition, I would like to highlight a few unexplained observations, such as structured and transient luminescence during the freezing of water, where we might benefit from the expertise at the CMWS.



[1] In situ estimation of ice crystal properties at the South Pole using LED calibration data from the IceCube Neutrino Observatory, The Cryosphere, 18, 75–102, https://doi.org/10.5194/tc-18-75-2024, 2024.