The Solid-State Greenhouse Effect on icy bodies

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The so-called Solid-State Greenhouse Effect (SSGE) is a phenomenon similar to the atmospheric greenhouse effect. It takes place in materials, which are optically thin in the visible and opaque in the thermal infrared range, where incoming solar radiation is not absorbed within a small layer near the surface, as it is assumed in classical thermodynamic models, but at lower levels. Therefore, the SSGE leads to subsurface energy deposition.

The main interest of our research lies in the thermal properties of icy areas on Earth, Mars, Jupiter's satellite Europa, and comets. For this purpose laboratory measurements under space conditions with different sample compositions were performed. We present results of these experiments related to the SSGE. Model calculations in comparison with the experimental results will be presented in this talk.