Workshop

Imaging of Stellar Surfaces

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Title:
Solar observations with ALMA

Abstract:
The continuum intensity at millimeter wavelengths can serve as an essentially linear thermometer of the plasma in a thin layer in the atmosphere of the Sun, whereas the polarisation of the received radiation is a measure for the longitudinal magnetic field component in the same layer. The enormous leap in terms of spatial resolution with the Atacama Large Millimeter/submillimeter Array (ALMA) now makes it possible to observe the intricate fine-structure of the solar atmosphere at sufficiently high spatial, temporal, and spectral resolution, thus enabling studies of a wide range of scientific topics in solar physics that had been inaccessible at millimeter wavelengths before. The radiation observed by ALMA originates mostly from the chromosphere - a complex and dynamic layer between the photosphere and corona, which plays a crucial role in the transport of energy and matter and, ultimately, the heating of the outer solar atmosphere. ALMA observations of the solar chromosphere, which are offered as a regular capability since 2016, therefore have the potential to make important contributions towards the solution of fundamental questions in solar physics with implications for our understanding of stars in general. In this presentation, I will give a short description of ALMA's solar observing mode, it challenges and opportunities, and selected science cases in combination with numerical simulations and coordinated observations at other wavelengths. ALMA's scientific potential for studying the dynamic small-scale pattern of the solar chromosphere is illustrated with first results from Cycle 4.