

Review

SOLAR MAGNETOCONVECTION OBSERVED WITH GREGOR

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The Sun provides a unique laboratory to study cosmic magnetic fields. With an aperture of 1.5 m, the new solar telescope GREGOR operating in Tenerife is the largest of its kind in Europe. It provides an unprecedented combination of spatial and spectral resolution, and polarimetric sensitivity to investigate the small-scale magnetic fields on the Sun in the photosphere and chromosphere. The nature of the solar atmosphere is governed by energy transport in form of convection and radiation and their coupling with magnetic fields. GREGOR enhances our understanding of the various mechanisms of magneto-convective energy transport which determine a wealth of structures in sunspots, in active regions, and in the surrounding granulation. We will report on a range of topics, including magnetic reconnection in a flare, sunspot magnetic fields in the photosphere and chromosphere, material flows in active regions, and weak magnetism of the very quiet Sun. Imaging data provide details of the solar photosphere at a scale of 60 km on the Sun (0.08 arcsec angular resolution). GREGOR has resolved details smaller than 100 km in sunspot light bridges, which has advanced our understanding of magneto-convection. The excellent magnetic sensitivity in the IR enables the measurement of field strengths down to a few Gauss, unraveling for the first time that even the most quiet areas on the Sun are largely covered with magnetic field.