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Solar surface flows energy content from Hinode data and MOF Pic-du-Midi first observations

Thierry Roudier

Laboratoire d'Astrophysique de Toulouse-Tarbes, CNRS et Université de Toulouse, 14 avenue E. Belin, 31400 Toulouse, France

Michel Rieutord

Laboratoire d'Astrophysique de Toulouse-Tarbes, CNRS et Université de Toulouse, 14 avenue E. Belin, 31400 Toulouse, France

Francois Rincon

Laboratoire d'Astrophysique de Toulouse-Tarbes, CNRS et Université de Toulouse, 14 avenue E. Belin, 31400 Toulouse, France

Jean-Marie Malherbe

LESIA, Observatoire de Paris, Section de Meudon, 92195 Meudon, France

Daniel Brito

Daniel Brito IPRA - Université de Pau et des Pays de l'Adour 64013 Pau, France

Tom Berger

Lockheed Martin Advance Technology Center, Palo Alto, CA, USA

Abstract. T. Roudier (1), M. Rieutord (1), F. Rincon (1), J.-M. Malherbe (2), D.Brito (3), T. Berger (4) Z. Frank(4), L. Pares (1), E. Bourrec (1), F. Beigbeder (1)
Using a long time series of images from the Solar Optical Telescope onboard Hinode satellite, we reconstruct the horizontal velocity fields on an area of 76x76 Mm^2 at the Sun's surface. This allows us to determine the relation between length scales and correlation time. We find that the scale grows like the two-fifth power of the turn-over time. Using another set of images taken with the Narrow Filter Imager of the same instrument, we derive the vertical velocities and find that the associated spectral density of energy scales like k^2 in the range 2.5 to 30 Mm (k is the horizontal wavenumber). This power law is the one that is expected if we assume that the correlation time is controlled by the vertical velocity. In other words, two independent data sets show that the vertical velocity decreases with the horizontal length scale L, like $L^{-3/2}$.
We also show that, at small sub-granulation scales down to 0.3 Mm, the kinetic energy spectral density associated with vertical motions exhibits a $k^{-13/3}$-like spectrum, while the intensity fluctuation spectrum follows a $k^{-17/3}$-like spectrum. We discuss the physical origin of these scalings and argue that they provide a direct observational signature of buoyancy-driven turbulent dynamics in a strongly thermally diffusive regime.
Then, the first results on the radial velocity fields derived from observations with a potassium Magneto-Optical Filter (M.O.F.) installed at the Lunette Jean

R*ö*sch at Pic-du-Midi (diam. 50cm) and covering a large field of view (5'x8') will be presented.