
Large-scale dynamics of an active region from high-resolution spectroscopic observations at THEMIS.

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Résumé

We performed spectroscopic scans of the active region NOAA13380 on July 29, 2023 at Themis in the non-magnetic FeI line at 709 nm.

As the line profile is not affected by the presence of magnetic field this line is very well suited to study the dynamics of the active region.

Taking advantage of the efficient Themis AO system we use images from successive scans at several line-cords, formed at various depths,

to explore the rotational profile and large-scale motions in the sunspot, the penumbra and the granular region around the spot.

We find no rotational radial shear inside the sunspot nor in the granular region surrounding it, in contrast to the rotational shear observed

in the quiet photosphere. We are able to measure the difference of the rotational velocities of the spot and of the granular region, we find

a difference of 70 m/s, on the order of previous measurements using different methods.

We also find the evidence of a large-scale motion of the granular region in the direction of the spot with a speed on the order of 200 m/s.

Inside the spot we detect a differential motion towards the south that speed-up at altitudes between 40 km and 120 km.

We intend to apply this new analysis to a larger set of active regions in order to investigate the impact of such large-scale motions on their evolution.

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