SEMINAR

專題演講

國立中央大學 太空科學與工程學系

Department of Space Science and Engineering, National Central University

Time

Monday,April 29, 2023
17:00 – 19:00

On the Motion of Solar Pores and its Manifestations on Observable Physical Quantities at the Photosphere

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Google meet joining info

Video call link: https://meet.google.com/nob-yhgx-fbf

Solar pores are small dark spots in the photosphere with concentrated magnetic flux and without a penumbra. They are often observed to exhibit horizontal motions throughout their lifetime. We examine 61 compact solar pores identified from the Spaceweather HMI Active Region Patches (SHARP) from 2011 to 2018 to investigate whether any relationships may exist between the pore movement and its observable physical quantities. The direction of movement ($\boldsymbol{\phi_t}$) and the direction of maximum magnetic pressure difference ($\boldsymbol{\phi_{dPo}}$) of the solar pores are often either parallel or anti-parallel, with more parallel cases than the anti-parallel cases. This indicates that the solar pores are more likely to move in the direction of stronger magnetic pressure. Our analysis also indicates that the front side of the moving pores are more likely to have higher inclination, stronger horizontal and radial fields than the back side, and that the pores are on average brighter at the front (back) sides of its outer (inner) layer. An examination of 19 pairs of bipolar pores reveal that $\boldsymbol{\phi_{dPo}}$ is slightly pointing towards the north (south) in the northern (southern) hemisphere, and the signs of $< \Delta P_{\mathrm{mag}} >$ for the leading and trailing pores of the pair are always opposite, which we call the ΔP_{mag} rule. Finally, the correlation coefficients between $\boldsymbol{\phi_t}$ and $\boldsymbol{\phi_{dPo}}$ are both higher than 0.74 for the parallel and anti-parallel cases. Despite the high correlation, the causality analysis using transfer entropy reveal no causal relationships between $\boldsymbol{\phi_t}$ and $\boldsymbol{\phi_{dPo}}$.

Keywords: Solar physics, Solar pores, Solar magnetic fields, Solar magnetic flux emergence, Transfer entropy, Causality analysis