

Space Plasmas in the Solar System, including Planetary Magnetospheres (D)  
Pickup Ions in the Heliosphere and Beyond (D1.3)  
Consider for oral presentation.

## **MAGNETIC TURBULENCE IN THE VERY LOCAL INTERSTELLAR MEDIUM FROM MACROSCALES TO MICROSCALES**

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Voyager 1 (V1) has been exploring the heliospheric boundary layer in the very local interstellar medium (VLISM) since August 2012. This study presents a broadband multi-scale analysis of VLSIM magnetic turbulence between 124 and 144 au from the Sun, as observed by V1 during the period from 2013.36 to 2019.0. We use high resolution 48-s data and show the existence of physically relevant fluctuations on scales as small as the ion inertial length in the thermal plasma. In the fine-scale regime below  $\sim 10^3$  au, an evidence is provided of the intermittent turbulence cascade which retains a significant level of magnetic compressibility. Observed fluctuations are compatible with the presence of filamentary structures and sawtooth-like waveforms of mixed compressible/transverse nature. A striking example of small-scale enhanced turbulence (wavelengths in the range of  $\sim 1 - 10^3$  ion inertial lengths) is observed in front of the shock wave that overtook V1 on DOY 237, 2014 at 140 au from the Sun. This event starts on DOY 178, 2014, and suggests the presence of an ion foreshock. Besides, small-scale intermittency has been growing smoothly since 2018.5. Our analysis suggests that local processes are contributing to the production of turbulence in this regime. We identified the range of scales where V1 measurements may be affected by the contribution from pickup ions. On larger scales, coherent wave trains with the correlation time scale in the range of 15 – 100 days dominate the spectrum of fluctuations. The spectral analysis is suggestive of a Burgers-like ( $f^{-2}$ ) turbulence phenomenology induced by solar activity. Analysis of Coulomb collisional scales shows that the heliospheric boundary layer is not featureless at scales below the mean free path of  $\sim 1$  au.