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Development of turbulence in a dusty plasma MIERK SCHWABE, SERGEY ZHDANOV, CHRISTOPH RÄTH, German Aerospace Center (DLR) — Complex or dusty plasmas are low temperature plasmas which contain micrometer-sized particles ("dust"). The microparticles obtain high charges and interact with each other, effectively forming a solid, liquid or gas state in which the microparticles take over the role of molecules in conventional systems. Complex plasmas often are in a turbulent state, for instance when instabilities like the "heartbeat" instability or intense waves are present. The movement of the microparticles, the carriers of the turbulent interactions in complex plasmas, can be directly followed, unlike that of atoms and molecules in conventional experiments on turbulence. Here we present results of an experiment on the development of turbulence in a complex plasma in the PK-3 Plus laboratory on board the International Space Station. The microparticle cloud was first stabilized against an instability. Once the stabilization was turned off, the cloud became unstable, and the movement of the particles became turbulent. In the report, we show how the energy spectra evolve during the development of turbulence. In the case of fully developed turbulence, the spectra display multiple cascades explaining well the transport of turbulent energy and enstrophy.

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