A puzzling result in the recent years in plasma turbulence has arguably been the discovery of the quasi-regular pattern of ExB flows and interacting avalanches that we have come to call the “plasma staircase”. This structure is a spontaneously formed, self-organising pattern of quasi-regular, long-lived and localised shear layers that organise the turbulent transport. Called “jets” in the context of planetary flows they are pervasive features of planetary atmospheres and critically influence the transport properties of heat, momentum, chemicals or even biota. An acute proximity exists between fusion plasmas and geophysical fluid dynamics. The plasma staircase is investigated through flux-driven gyrokinetic computations using the GYSELA code. Extensive parameter scans show that this flow pattern is a robust feature of plasma size, collisionality, turbulence drive, safety factor profile and poses new challenges in understanding profile stiffness, distance to criticality and nonlocal effects. The plasma staircase, in contrast with its GFD counterpart, is indeed intimately linked with heat and momentum avalanching. Forcing choices matter, the staircase step size is mesoscale, it modulates the outer scale of the avalanche distribution and is beneficial for confinement. The plasma staircase also displays a dynamics of its own and meanders, river-like. The overall transport within the plasma is really that of a self-organised state in which the staircase is a key dynamical player. Observed and characterised theoretically, we went on hunting for its existence in actual experiments, using fast-sweeping reflectometry turbulence correlation measurements in ToreSupra. This is a rare instance in plasma turbulence of prediction from a numerical model leading to discovery in observations. Many of its features (meandering, scaling with the plasma size,…) agree remarkably well with the theoretical predictions. This observation may have far-reaching consequences for the understanding of turbulent organisation and for the validation of models of plasma turbulence.