Planetary Atmosphere Model Constraints and Lessons from JWST Transiting Exoplanet ERS observations.

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JWST Transiting Exoplanet Early Release Science (ERS) program observations has given us exceptional transmission and emission spectra of various exoplanet atmospheres across multiple JWST instruments, with high precision and large wavelength coverage spanning 0.5 to 5.6 microns. ATMO, a 1D planetary atmosphere model has been applied to all these observations to characterise these exoplanet atmospheres, specifically WASP-39b, WASP-96b and WASP-18b. In this talk I will show the constraints that we obtain on the metallicity, carbon to oxygen (C/O) ratio, temperature redistribution, Pressure-Temperature (P-T) structure, vertical mixing, individual species abundances and presence of clouds and haze in the atmospheres of these planets. I will discuss some of these constraints in comparison to previous observations and also solar system planets. I will talk about the ATMO model grids with radiative-convective equilibrium P-T profiles consistent with equilibrium chemistry and the dis-equilibrium chemistry grids, as well as ATMO retrieval tool, that we developed and used to obtain these constraints. Finally, I will discuss the lessons that we learnt while modelling and interpreting these JWST observations, and the limitations of the current models that need to be improved to better interpret the observations that we will obtain in the near future.