Introduction: The New Horizons flyby of Pluto and its four surrounding satellites system in 2015 changed our original assumptions and understanding of this distant planet and its moons. The information provided from the mission gave new geological, compositional and atmospheric datasets along with a complex range of images never seen before. Amongst the shear volume of new datasets arriving from New Horizons is renewed information about the structure and composition of Pluto’s atmosphere.

Research: The Alice Instrument on the New Horizons spacecraft was used to assess Pluto’s atmosphere during the flyby event in 2015. An ultraviolet solar occultation is sensitive to measuring the structure and composition of N2 rich atmospheres. The findings from the observation confirmed our past understanding of Pluto atmospheric composition of the presence of N2, CH4, C2H2, C2H4, and C2H6 [1]. Gladstone et al. also investigated the atmosphere of Pluto and found that the upper atmosphere is colder and more compact than expected [2]. Because Pluto’s extremely cold upper atmosphere, it also infers that the escape rate of nitrogen is ~10,000 times slower than predicted [2].

The research team shows that the planet’s atmosphere is much more complex and diverse than originally expected - it hosts numerous extensive layers of haze. The extensive expanse of haze throughout the planet at all altitudes can be seen in images provided by New Horizons. The blueish colour and the scattering properties of the haze are consistent with the aforementioned atmospheric composition. It is currently still unclear of the cause, dynamic and formation of this haze or what its implications are on the overall behavior of the planet’s atmospheric system.

Pluto’s atmospheric system has direct links to climate and seasonal changes. This interconnected system shows that atmospheric composition and pressure changes have a significant impact on surface characteristics including planetary frost bands [3]. The mapped infrared spectra across the encountered hemispheres of Pluto show us that the volatile methane, carbon monoxide and nitrogen ices dominate the planet’s surface as originally expected [3]. The complex spatial distribution is resulting from sublimation, condensation and glacial flow from seasonal, geological and atmospheric changes.

Conclusion: The colder than expected outer atmosphere of Pluto along with slower rate of escape rate of nitrogen have an important implication for the continued evolution of Pluto’s atmosphere. No sufficient details for the study of dynamics and formation of the haze has been completed and should be further explored. The mission lacked capability to make in-situ atmospheric measures to study the haze-like phenomenon and overall atmospheric dynamics. Future missions should account for these capabilities for further study of Pluto’s atmospheric composition.

References: