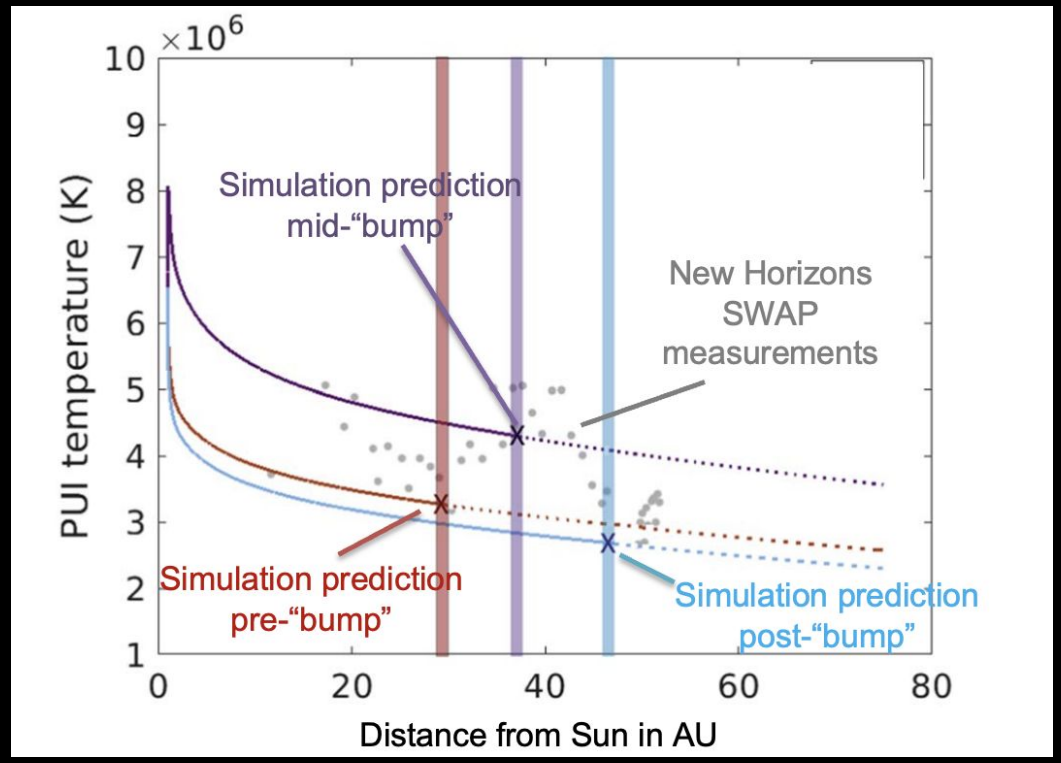
PUI HEATING IN THE SUPERSONIC SOLAR WIND

- **Science Question:**
  - Do PUIs get heated as they propagate in the supersonic solar wind?
- **Observations:**
  - NH' Solar Wind Around Pluto (**SWAP**) instrument detected some heating of PUIs between 2015 and 2020. It detected an unexpected "*bump*" in PUI temperature over a five-year period when NH was between 31 – 46 AU from the Sun.
- **Analysis and results:**
  - We showed that observations by the ACE and Wind spacecraft orbiting the Earth revealed a **50% increase** in the **solar dynamic wind pressure** in 2014 that could partially explain the PUI heating and temperature bump in the outer solar system in the following years.
  - Moreover, PUI and thermal solar wind simulations indicate that **interplanetary shocks** in the supersonic solar wind **heat PUIs preferentially** and could explain their sudden change in temperature.
- The heating of PUIs in the supersonic solar wind also results in an elevated production of **Energetic Neutral Atoms (ENAs),** which are useful for sensing the structure of the heliosphere.



PUI temperature as a function of New Horizons distance from the Sun in AU. The "bump" in the gray points indicate a temporary increase in PUI temperature observed by NH. Three theoretical temperature models (red, purple, blue curves) were used to predict the PUI temperatures when accounting for solar wind properties.

Mostafavi et al., 2025. *The Astrophysical Journal, doi: 10.3847/1538-4357/ada891*