Voyager 1 detects persistent plasma waves in interstellar space.
The discovery opens a new avenue to explore structure in the nearby interstellar medium from sub-AU to tens of AU scales.

**BACKGROUND:** Until now, Voyager 1 has measured the density of the interstellar medium (ISM) using transient plasma oscillation events that are triggered by shock waves of solar origin. Plasma oscillations are detected in the electric field spectrum at the plasma frequency, which is directly related to the plasma density.

**METHODS:**
- **Plasma Wave System (PWS) wideband receiver**
- **antenna voltage (rate 28 kHz)**
- **frequency-time electric field spectrum**
- **mask telemetry errors**
- **search for new signals**

**RESULTS:** A New Class of Plasma Wave Emission in the ISM
- Weak (requires averaging >1 epoch)
- Narrowband (<0.04 kHz)
- Persistent (~2017 to early 2020)
- Raises interesting possibilities for a future interstellar probe!

**INTERSTELLAR TURBULENCE**
Right: Plasma frequency extracted using a friends-of-friends algorithm (black), and a Gaussian process model fit to the data (blue). The variance of the density fluctuations is directly related to the amplitude of the turbulence wavenumber spectrum:

\[ P_{\text{wave}}(q) = C_q^2 q^{-\eta}, \quad \eta_0 \leq q \leq \eta \]

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