

Herschel: Fourth 'phase' of water

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- HIFI is a versatile instrument
 - Wide spectral coverage and high spectral resolution
 - Physical conditions & chemical inventory
 - Kinematics: 3rd dimension in complex sources

- HIFI is specifically built:
 - To probe the role of water in the physics and chemistry in the Universe
 - For unbiased spectral line surveys which will provide a new view of the molecular inventory and the physical conditions in space
 - In addition:
 - Biased spectral surveys to probe chemistry
 - Atomic fine structure lines (CII/NII) to probe the interstellar medium of galaxies, in particular the dynamical aspects

1. Water in the Universe

- a. Water is very abundant in many regions in space
- b. Water is a key molecule in regions of star and planet formation
- c. Water dominates the energy balance in those regions
- d. Water is a cornerstone molecule in the chemistry of space
- e. Water provides a powerful tool to probe the physical conditions

2. Studies of water in the Universe

- a. Requires space-based observations
- b. HIFI/Herschel can “fingerprint” water and related molecules
- c. HIFI/Herschel can probe ~40 water lines that span a range in excitation characteristics
- d. HIFI/Herschel can probe the chemical intermediaries that lead to water

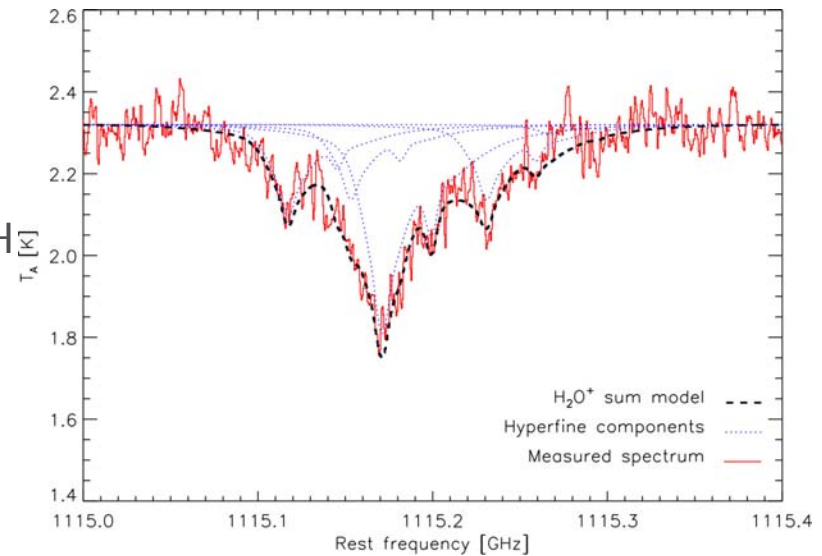
The water ion H_2O^+

Identified through its tell-tale spectroscopic signature which acts as a fingerprint

Preparatory science:

Theoretical studies: Simon Bruderer at ETH Zurich

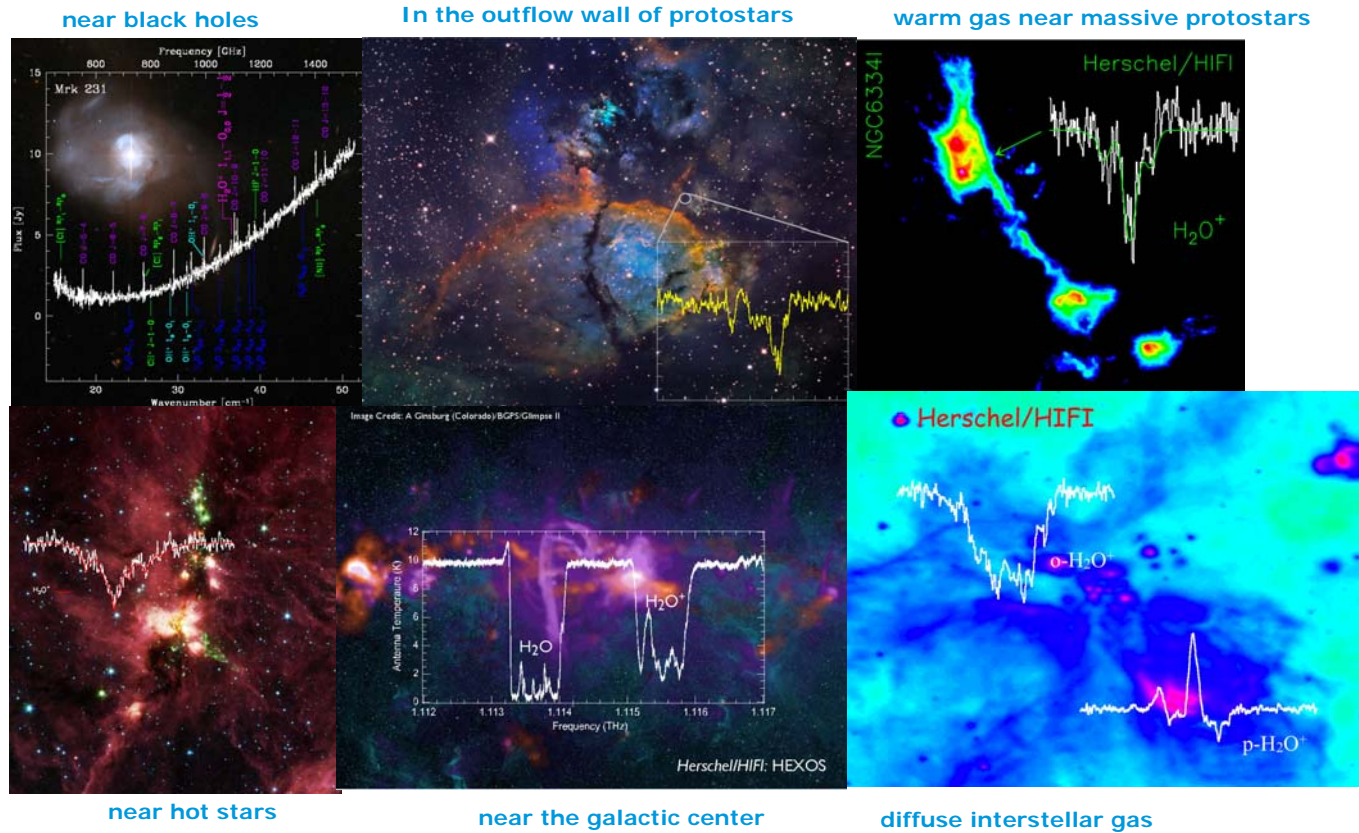
Supporting experimental analysis: Holger Muller at Cologne



The unique spectroscopic fingerprint of the water ion

The Water Ion in the Universe

The water ion is everywhere, particularly in regions of energetic processing



THANK YOU

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