Herschel/HIFI observations of water towards SgrB2(M)

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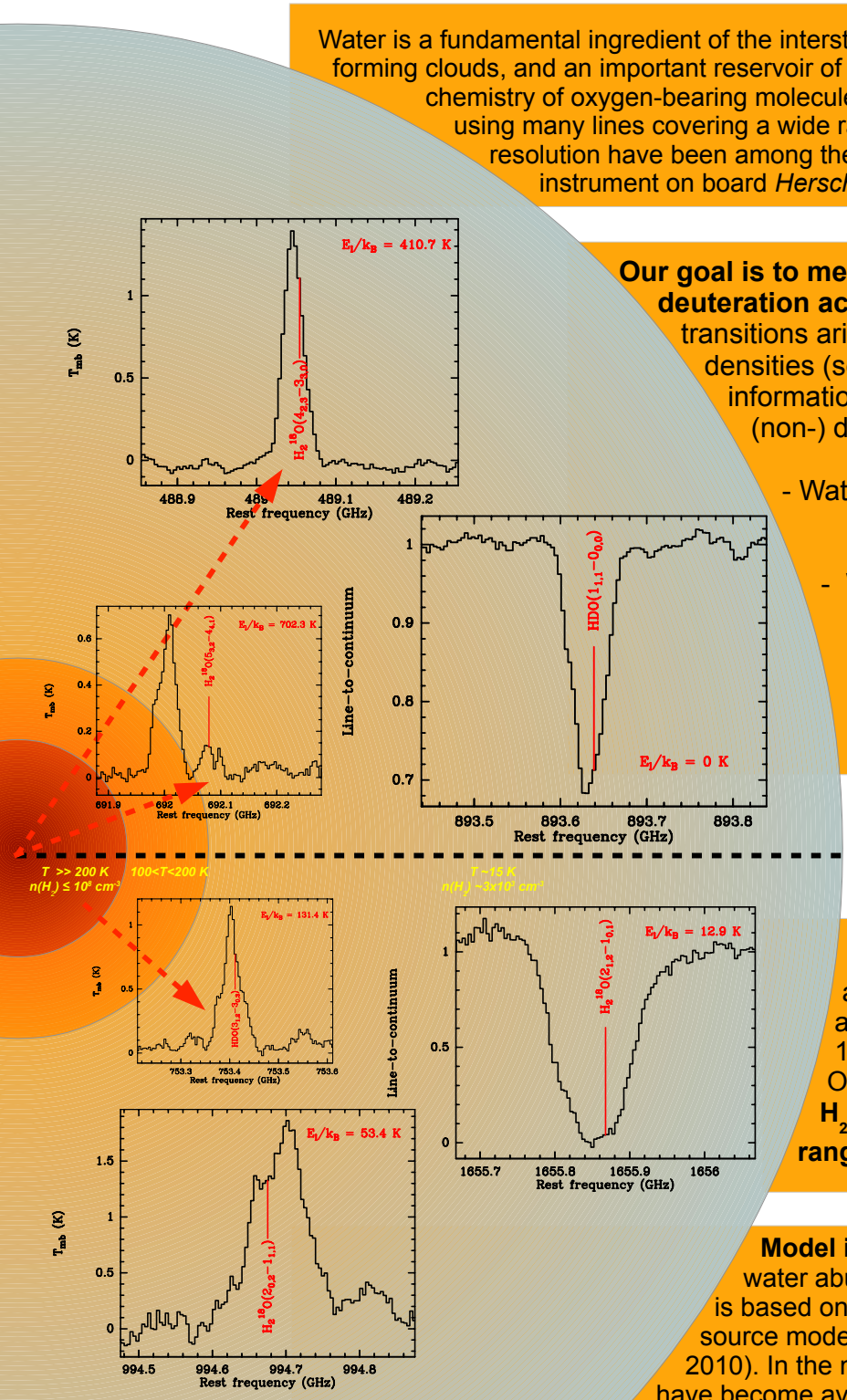
Water is a fundamental ingredient of the interstellar medium.It is a major coolant of star-forming clouds, and an important reservoir of oxygen and therefore a key ingredient in the chemistry of oxygen-bearing molecules. Investigations of the water abundance using many lines covering a wide range of excitation levels with high spectral resolution have been among the main reasons for building the HIFI instrument on board *Herschel.*



Our goal is to measure the stratification of water and its deuteration across the Sgr B2 envelope. Different transitions arise at different gas temperatures and densities (see figure). The comprehensive information about their shape, emission/absorption, (non-) detection and intensity tells us about:

- Water deuteration in both dense hot-core environment and diffuse envelope
- Water formation mechanisms (hot-core chemistry? Shocks? X-rays?) along the line of sight
- Grain-surface chemistry

Within the HEXOS Key Program we have acquired full spectral surveys of Sgr B2(M) across the whole HIFI band (480-1280 and 1450-1900 GHz).
Our full HIFI dataset is made up of **~20 $H_2{}^{18}O$ and ~10 HDO transitions sampling a range of excitation between 0 and ~700 K.**

Model in progress Our current knowledge of the water abundance and deuteration towards SgrB2(M) is based on a much smaller dataset and on simpler source models (spherical symmetry, Comito et al. 2003, 2010). In the meantime, new radiative transfer codes have become available that allow a much higher degree of complexity. We will:

- Model the dust temperature (based on a combination SMA (Qin et al. 2011) and Herschel data) using the radiative transfer code RADMC-3D (C. Dullemond, also see Schmiedeke et al., in prep.);
- Feed the temperature structure determined thus into the LIME code (Brinch & Hogerheijde 2010) to produce 3-D non-LTE models of the spectral observations;
- Compare the derived abundances and water deuteration to chemical models;
- More TBD

References:
http://www.ita.uni-heidelberg.de/~dullemond/software/radmc-3d/
Brinch & Hogerheijde 2010, A&A, 523, 25
Comito et al. 2003, A&A, 402, 635
Comito et al. 2010, A&A, 521, 38
Schmiedeke et al., in preparation
Qin et al. 2011, A&A, 530, 9