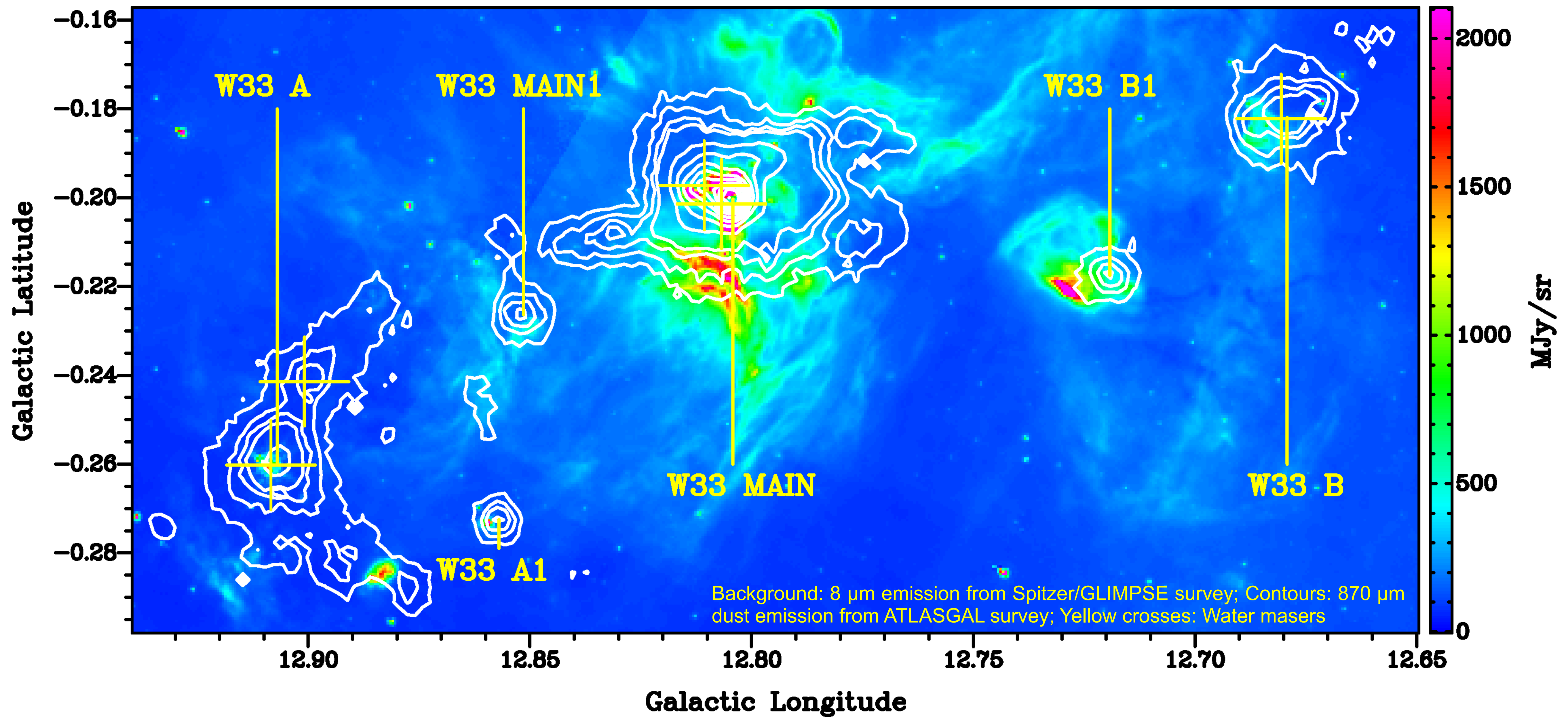# Chemical diversity in W33

K. Immer[1,2], R. Galván-Madrid[3], K. M. Menten[1], et al.

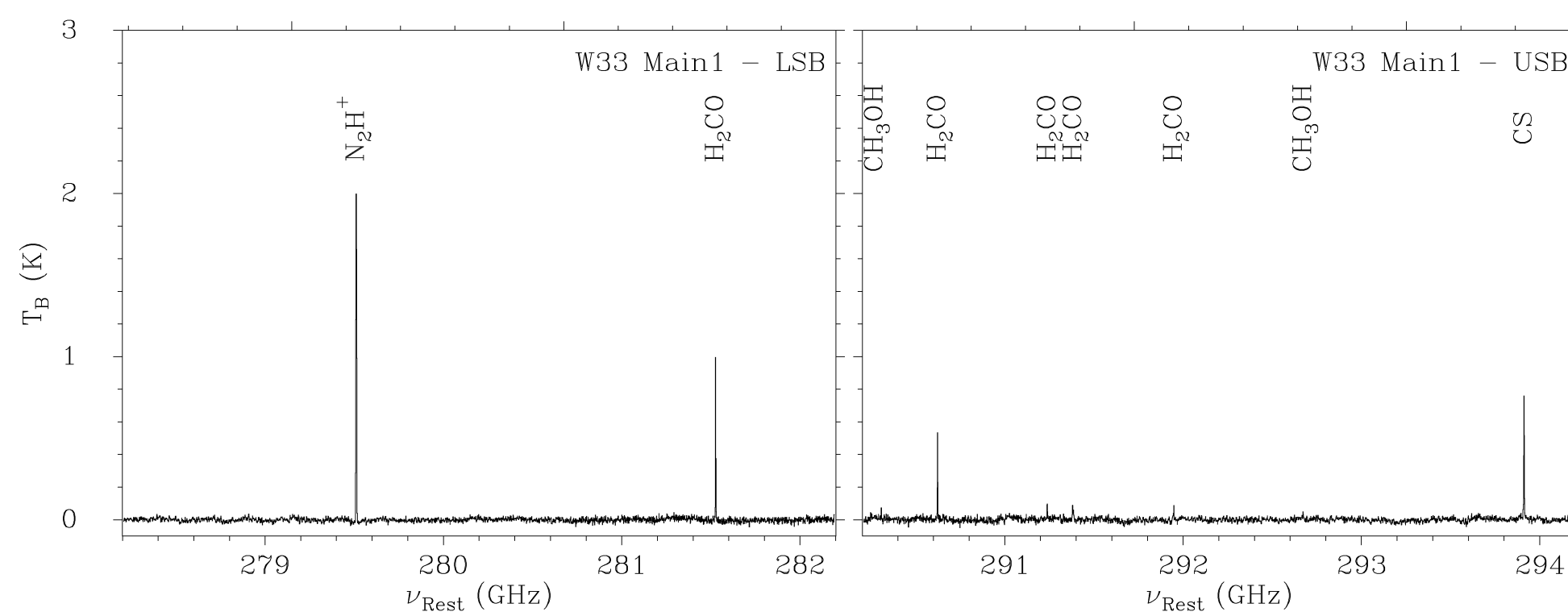[1]MPIfR, [2]CfA, [3]ESO

kimmer@mpifr-bonn.mpg.de

W33 is a massive star forming complex, containing objects in various stages of evolution, from quiescent dark clouds to highly active regions. Trigonometric parallax observations of water masers in three clouds of the complex yield a distance of 2.4 kpc to W33 (Immer et al., 2013, A&A, 553, 117). Since the clouds in W33 belong to the same complex and have similar distances, a comparative chemical study of the W33 clouds along an evolutionary sequence from prestellar cores to HII regions is feasible.
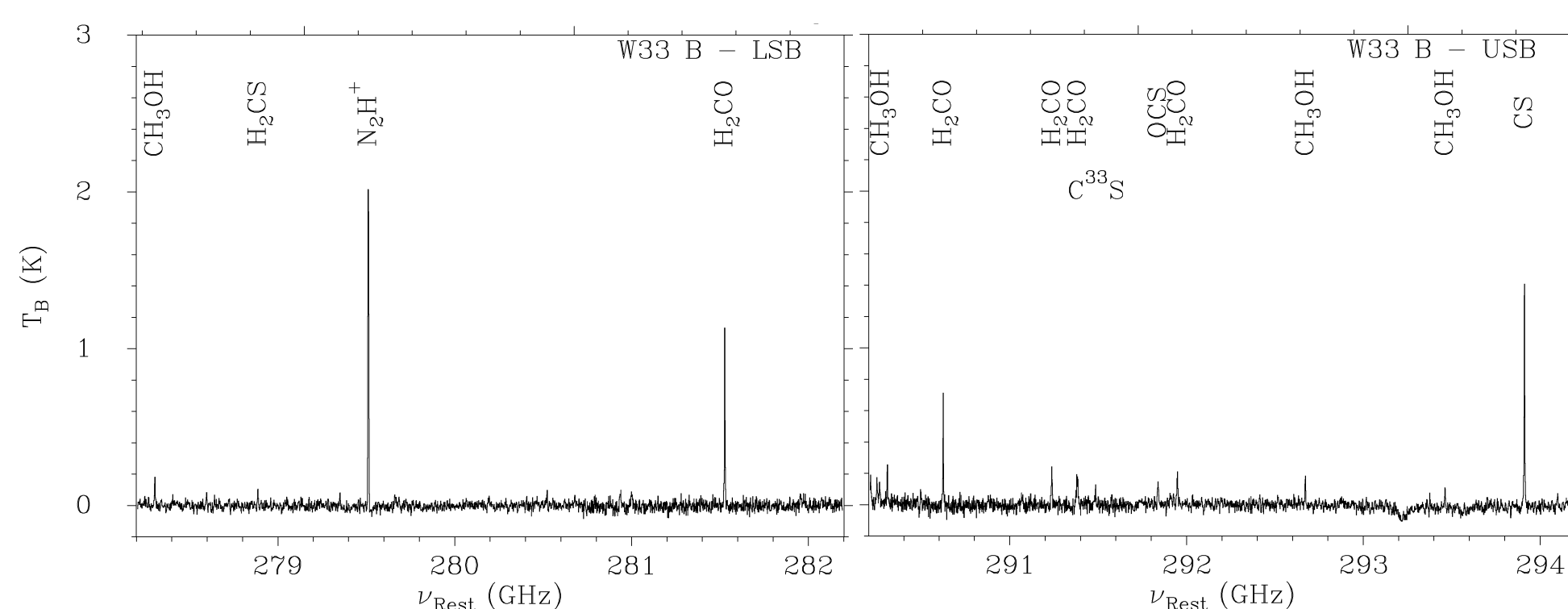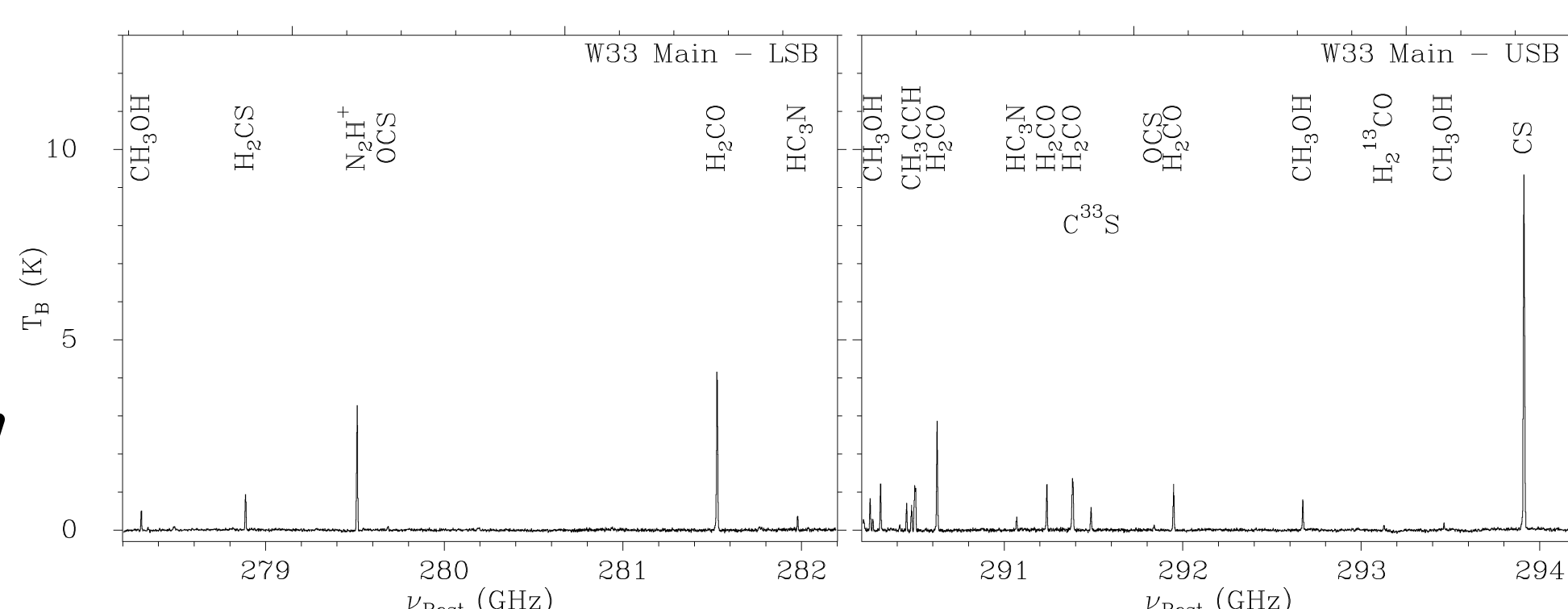

Background: 8 µm emission from Spitzer/GLIMPSE survey; Contours: 870 µm dust emission from ATLASGAL survey; Yellow crosses: Water masers

APEX – FLASH @ 280 GHz

W33 Main1

Similar spectra in W33 A1, W33 B1, and W33 B

Similar spectra in W33 A and W33 Main

SMA @ 230 GHz

Similar spectra in W33 Main1, W33A1, and W33 B1
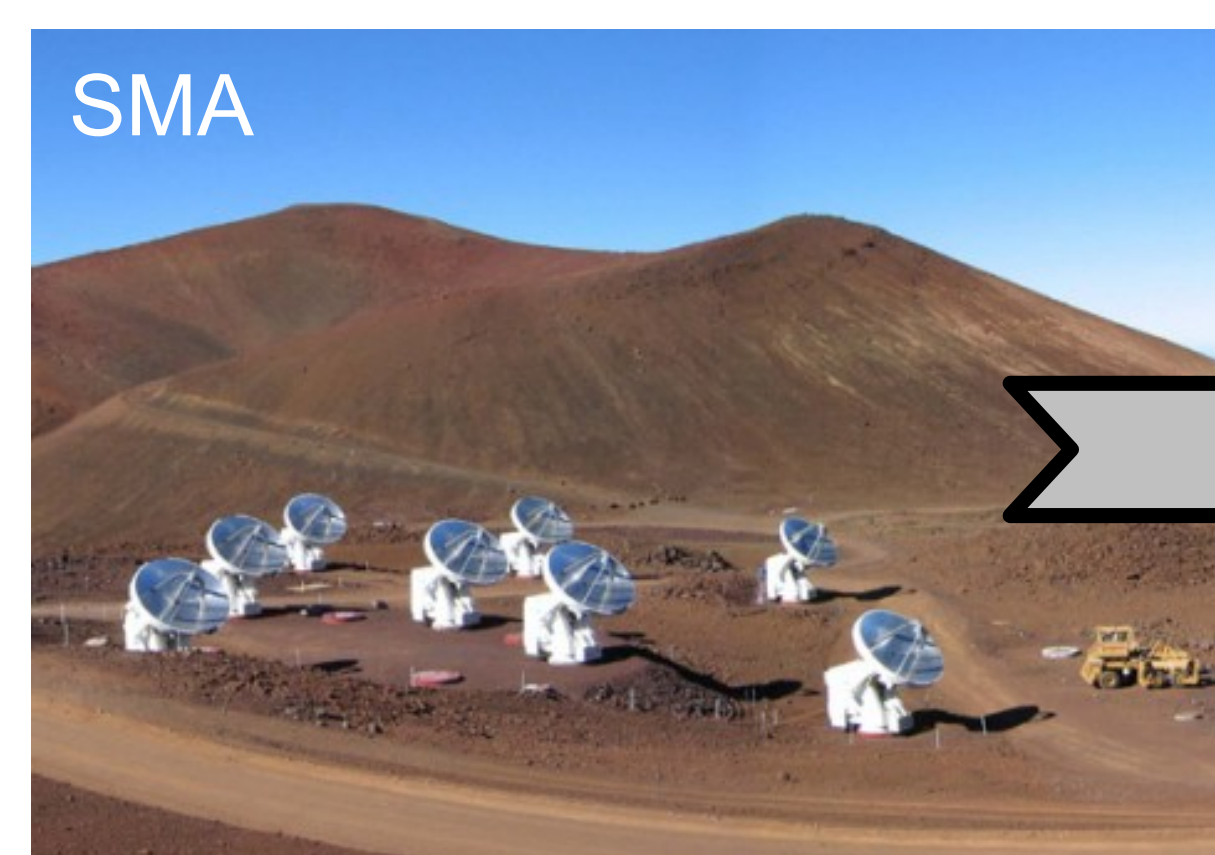
Similar spectra in W33 B and W33 A

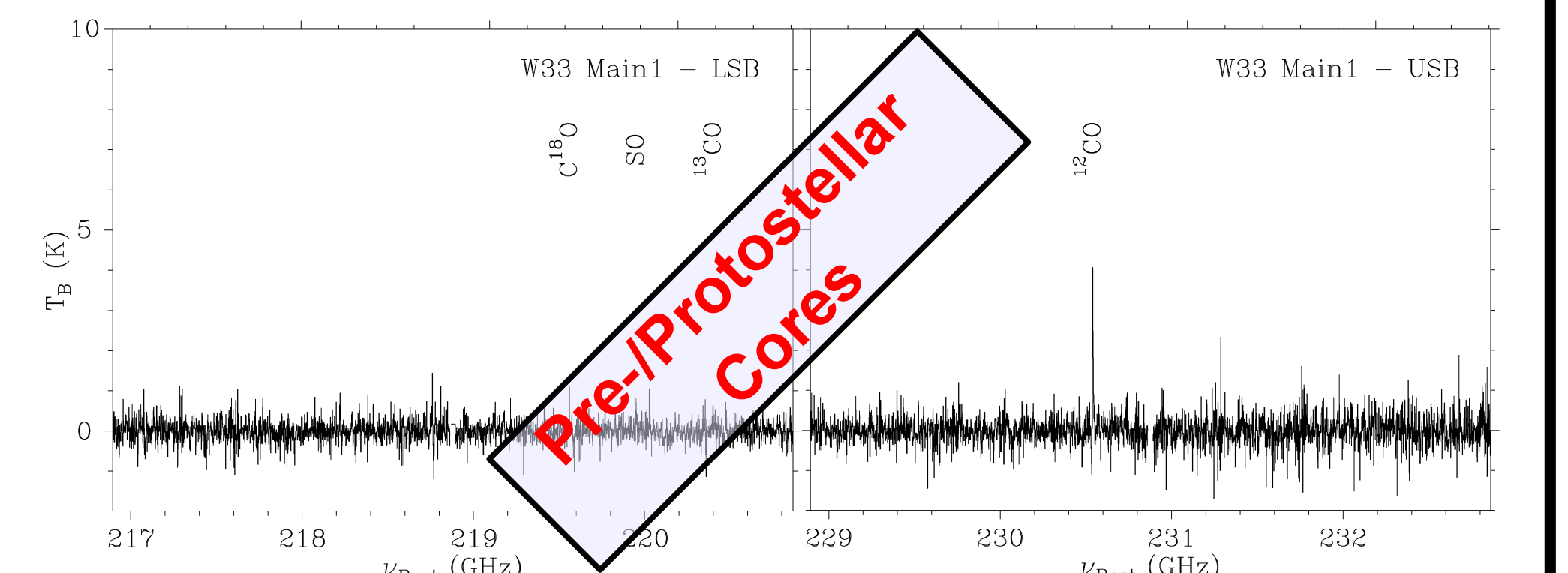W33 Main

Evolutionary Sequence

Observations

On-the-fly maps with Atacama Pathfinder Experiment (APEX) telescope at 278 – 282 and 290 – 294 GHz

Seven-pointing mosaic observations with Submillimeter Array (SMA) at 217 – 221 and 229 – 233 GHz
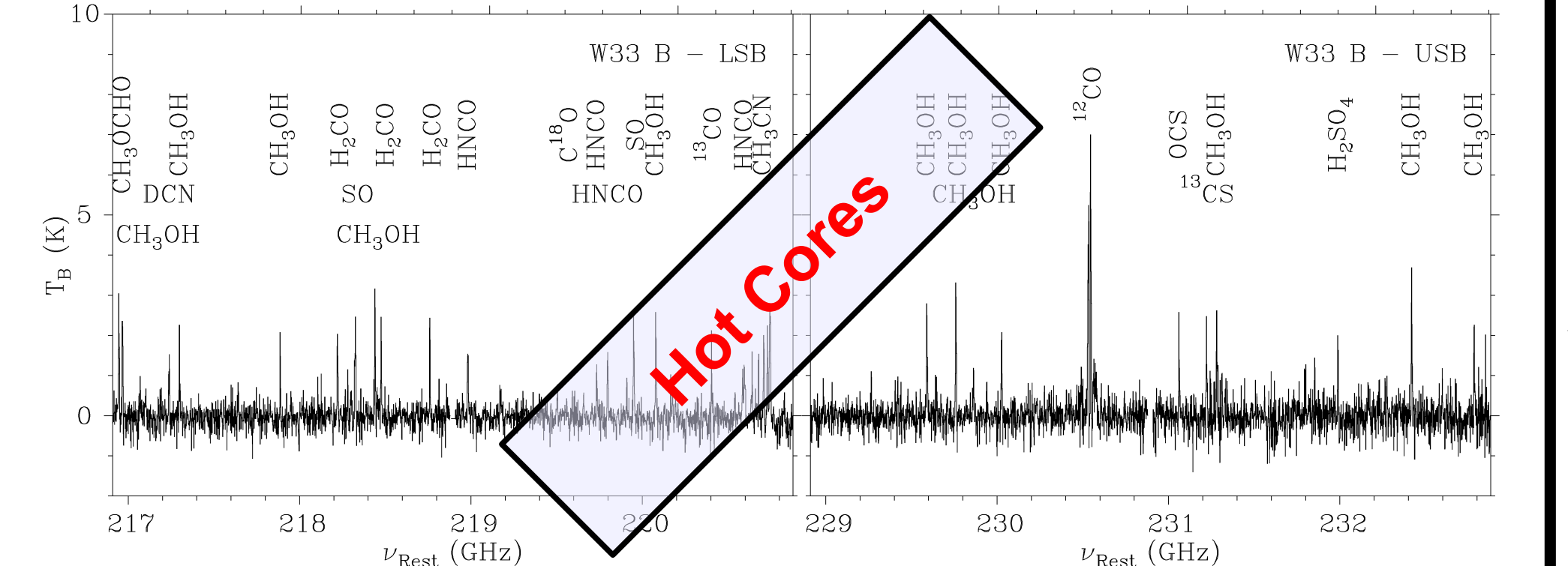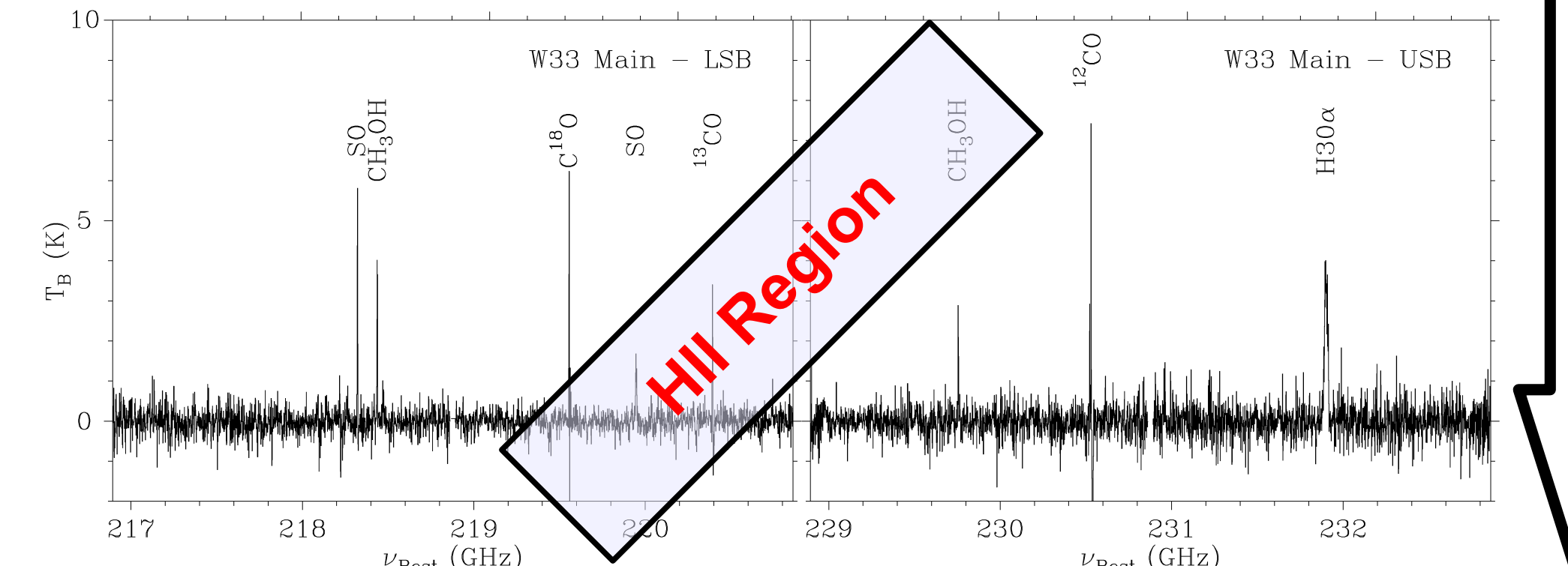
➜ Evolutionary sequence: W33 Main1 (Prestellar Core), W33 A1/W33 B1 (Protostellar Core), W33 A/W33 B (Hot Core), W33 Main (HII region)

➜ Chemical diversity along evolutionary sequence: Detection of transitions with higher excitation energies and from more complex molecules in later stages

➜ Differences on small (SMA, 0.05 pc) and large (APEX, 0.2 pc) scales:
W33 B: Almost only transitions of "simple" molecules (H_2CO, CH_3OH) in APEX data; Hot core spectrum with transitions of complex molecules in SMA data
W33 Main: Highest number of detected transitions in APEX spectra; SMA spectra resemble spectra from W33 A1/W33 B1 + high-energy transition of SO and H30α transition