

CCAT and Star formation

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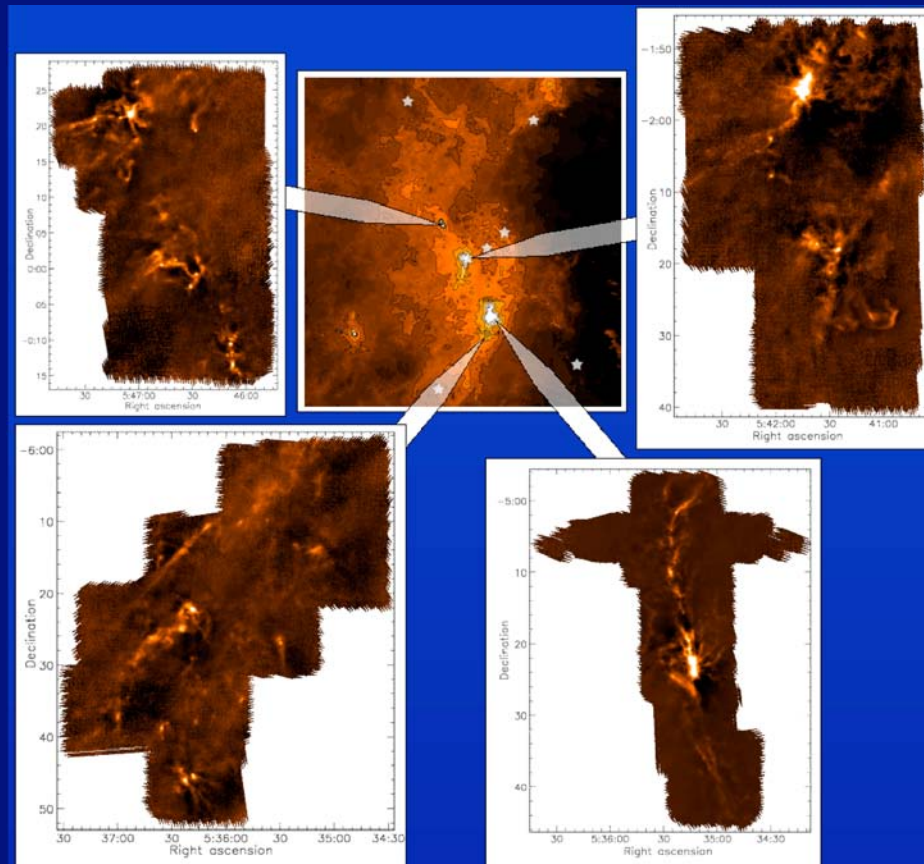
Cardiff University

CCAT meeting 13/09/06

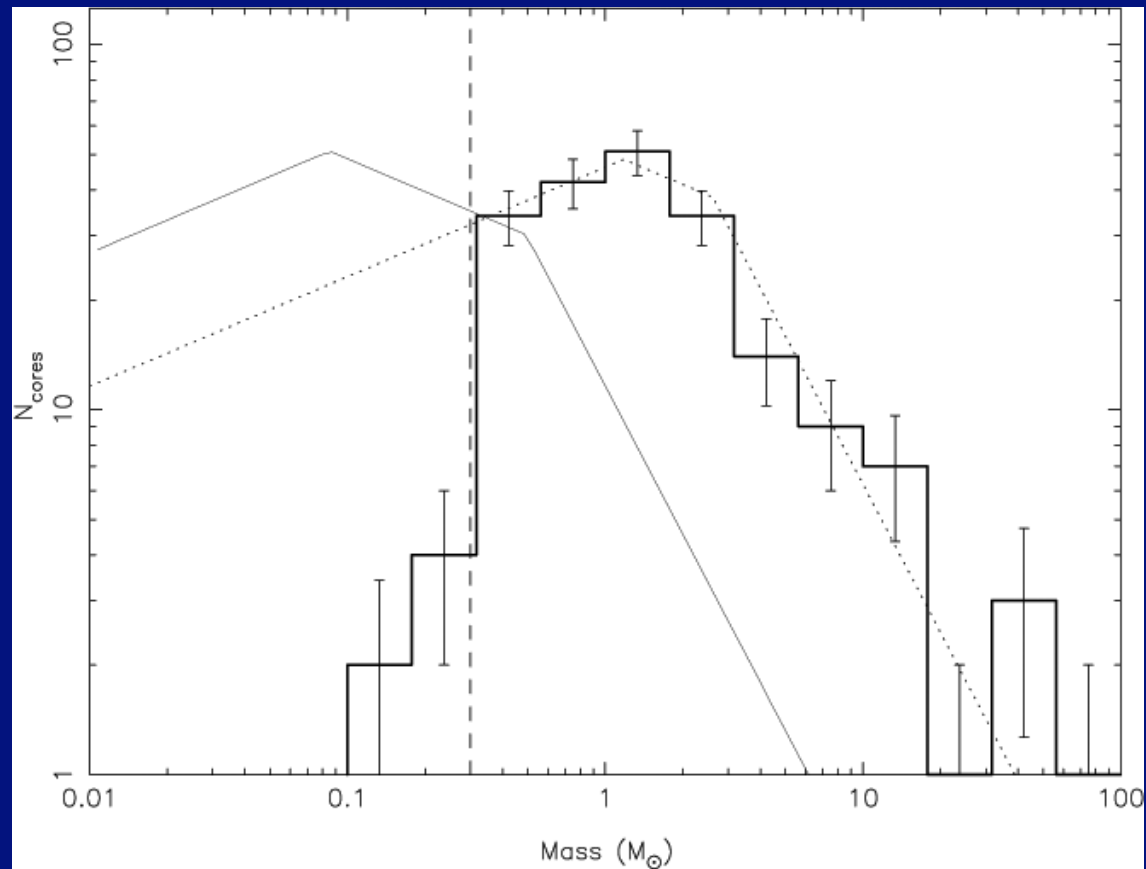
Where we are

- The greatest advance SCUBA has given to star formation studies is wide-field sub-mm astronomy.
- SCUBA-2 will give us an even greater lead in this area.
- JCMT will close in 2012.
- Where do we go after that?

Orion with SCUBA-1

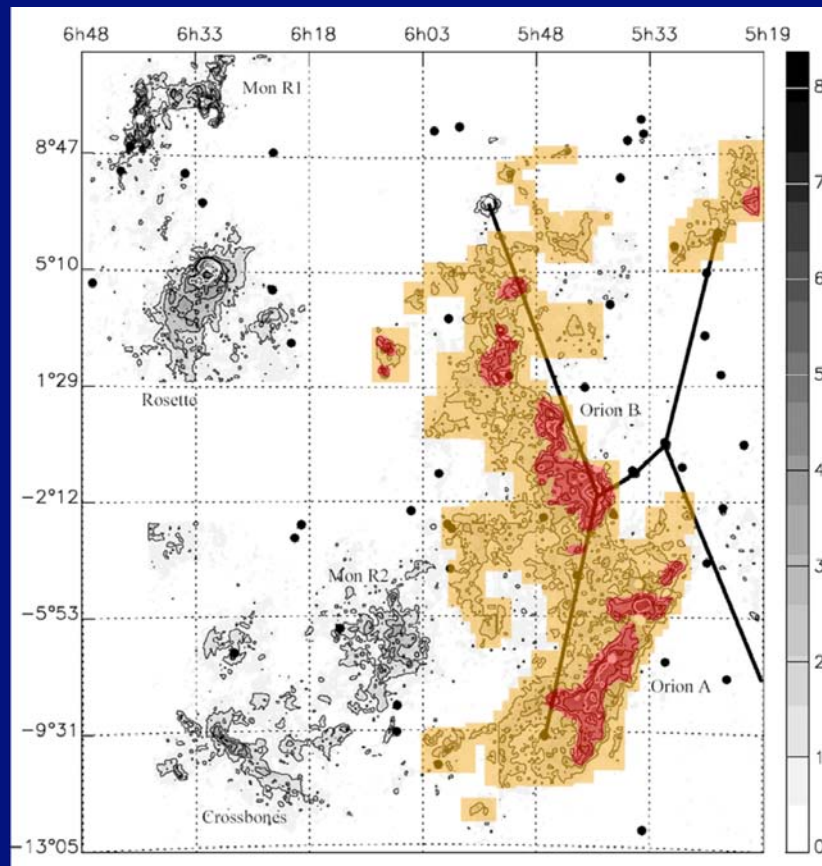


Orion core mass function

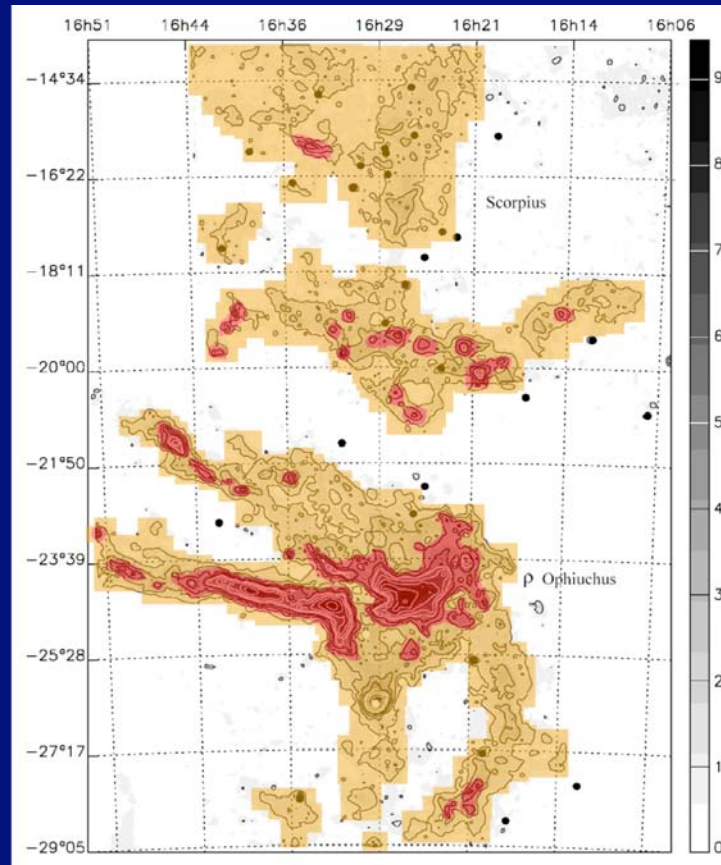


Nutter & W-T 2006 MN submitted

SCUBA-2 mapping area



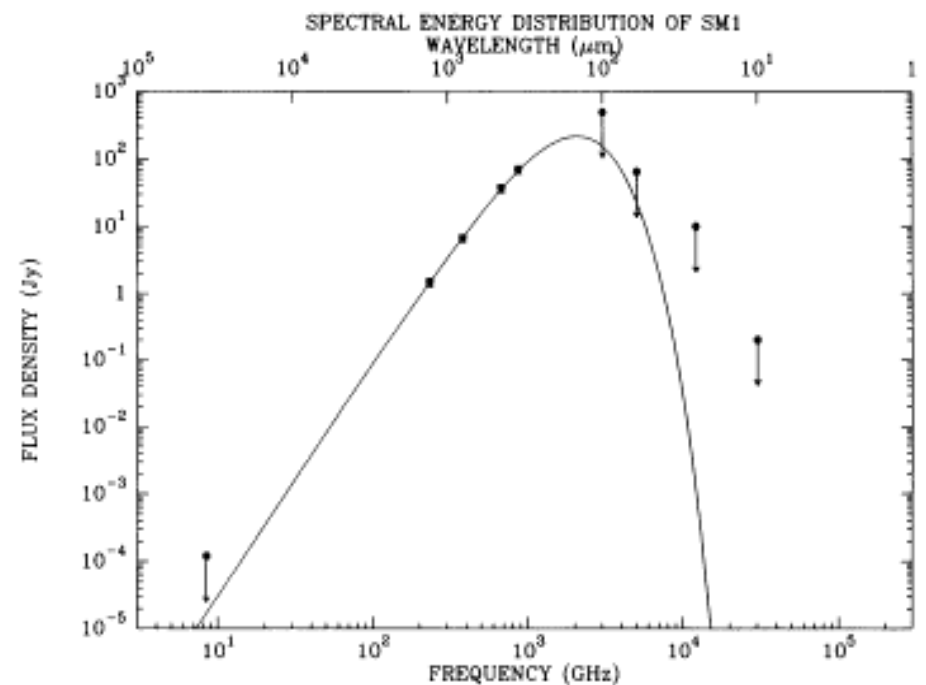
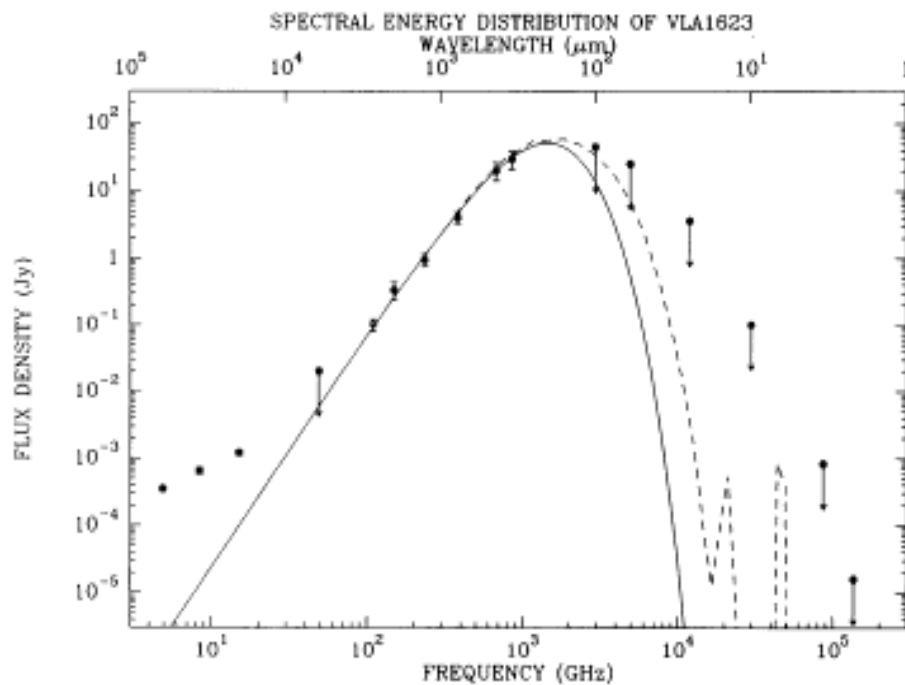
Oph-Sco with SCUBA-2



Statistics give us:

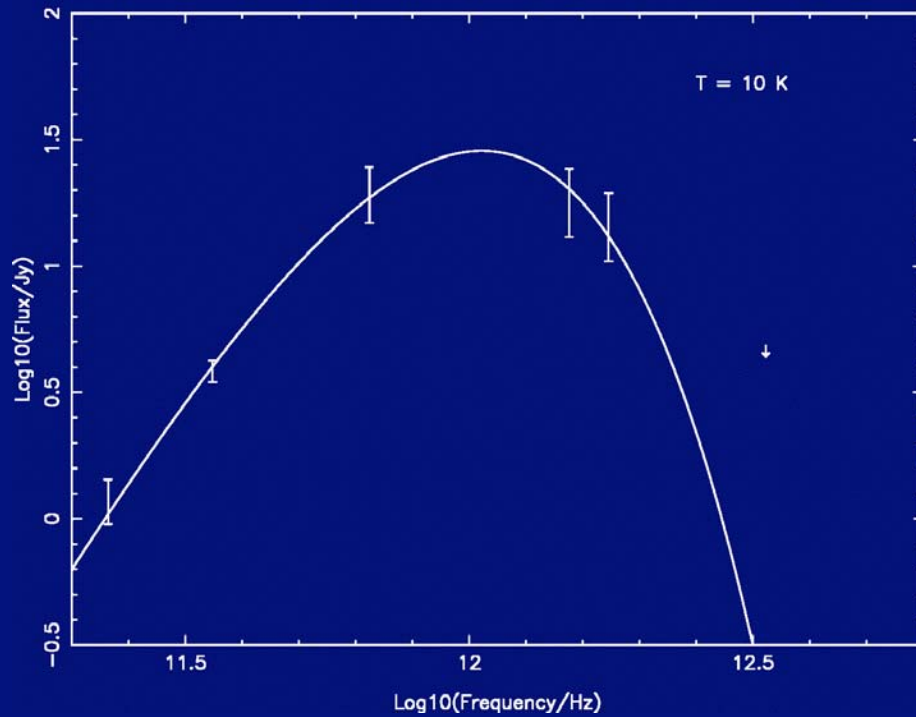
- Core mass functions
- Statistical lifetimes of pre-stellar and protostellar stages
- This then leads to accretion rates
- Which allows us to choose between various star formation model scenarios

SEDs of protostars & prestellar cores

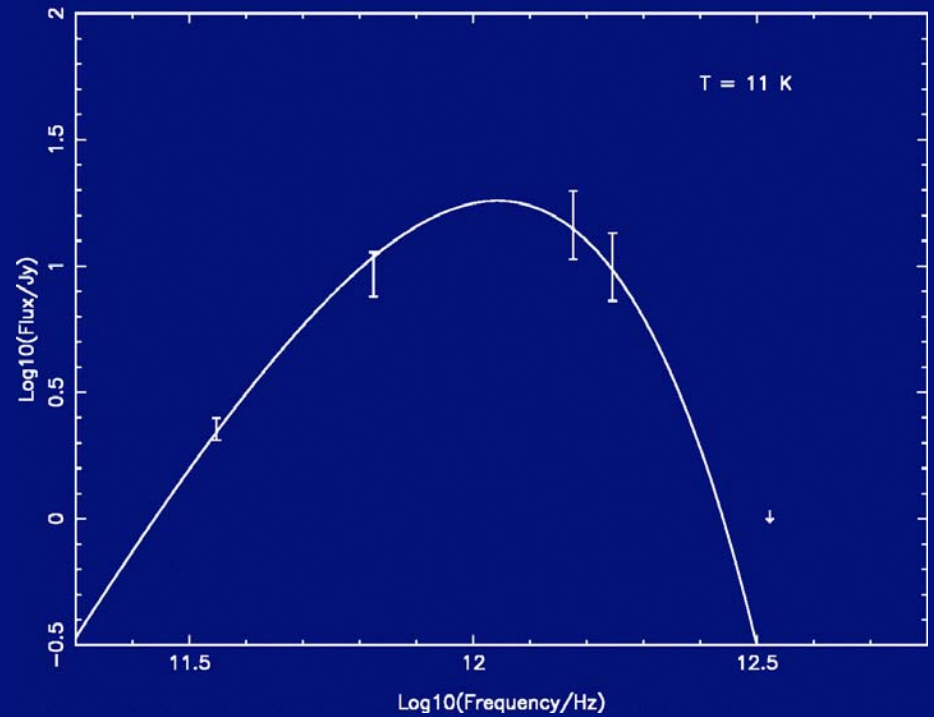


SEDs of L1544 & L1498

L1544 Spectral Energy Distribution



L1498 Spectral Energy Distribution



Why study 200 microns?

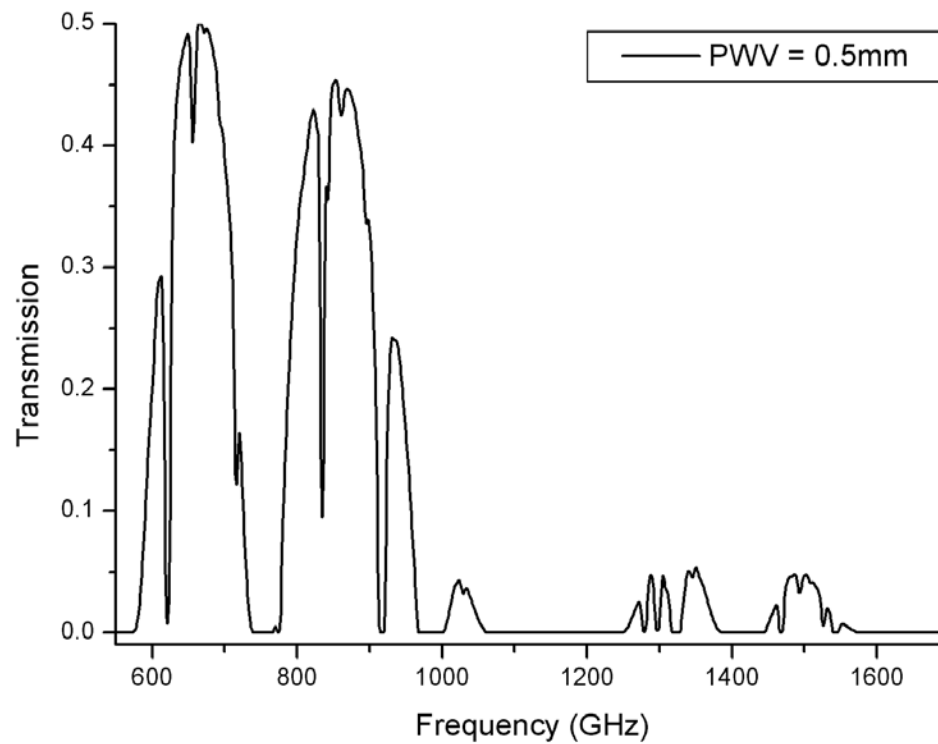
- Peak of 15K black-body
- Cold dust is brightest there
- Optimal wavelength to study:

Proto-stars

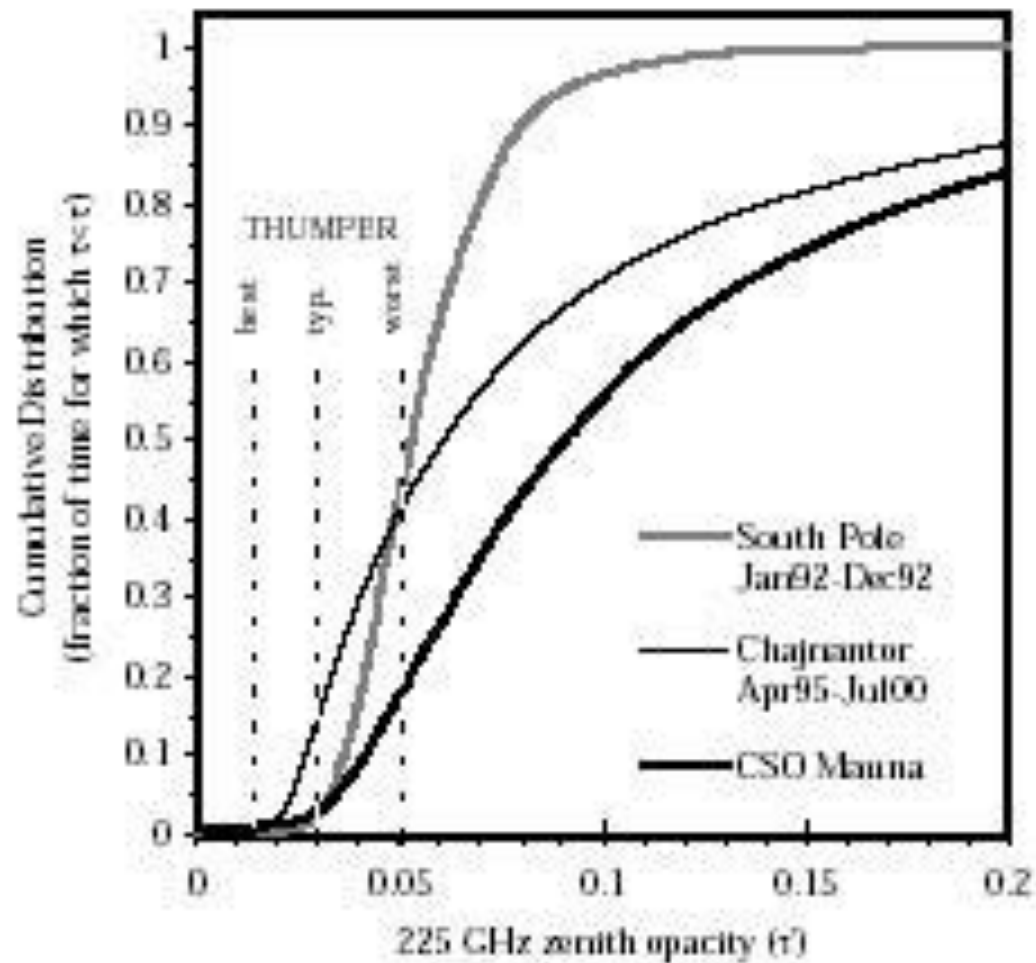
Pre-stellar cores

Embedded clusters

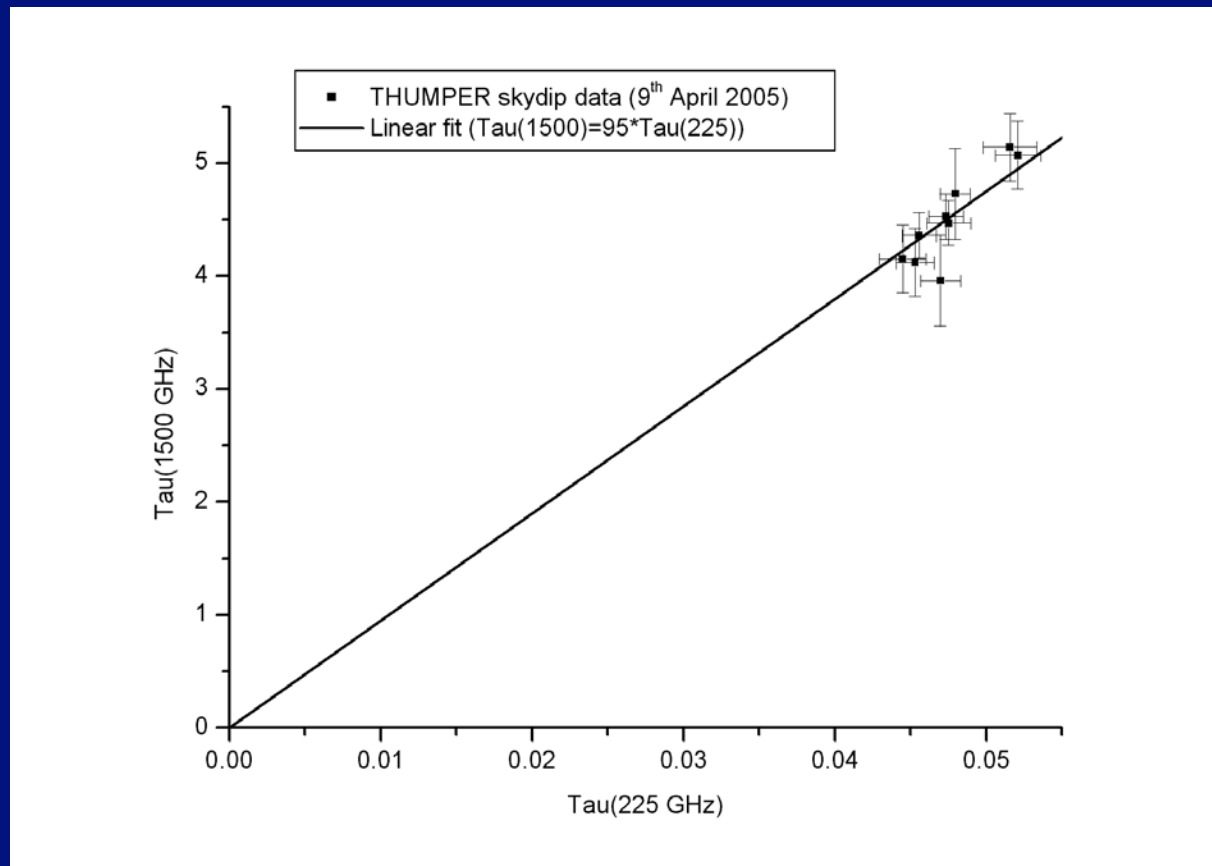
THz sky transmission



Weather statistics

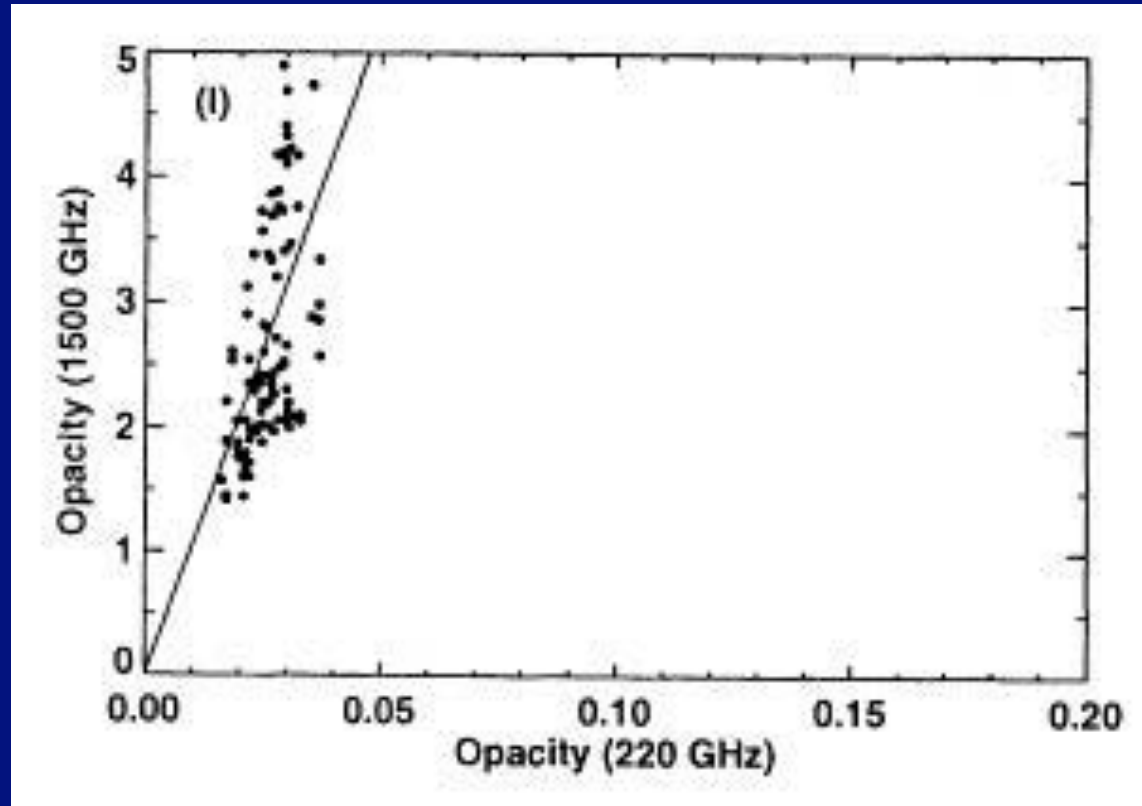


Tau relation (Thumper)



Ward-Thompson et al 2005 MNRAS 364, 843

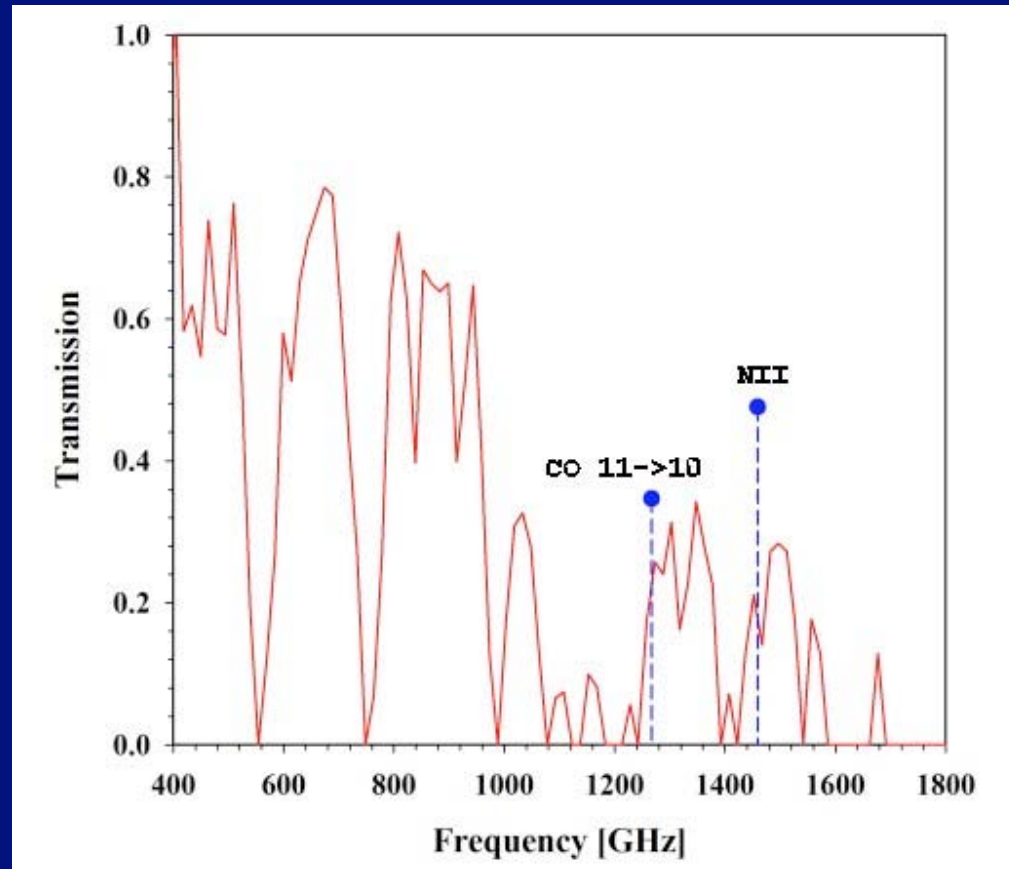
Previous measurements (Chile)



$$\tau(1500) = (105 \pm 32) * \tau(220)$$

(Matsushita et al 1999, PASJ, 51, 603)

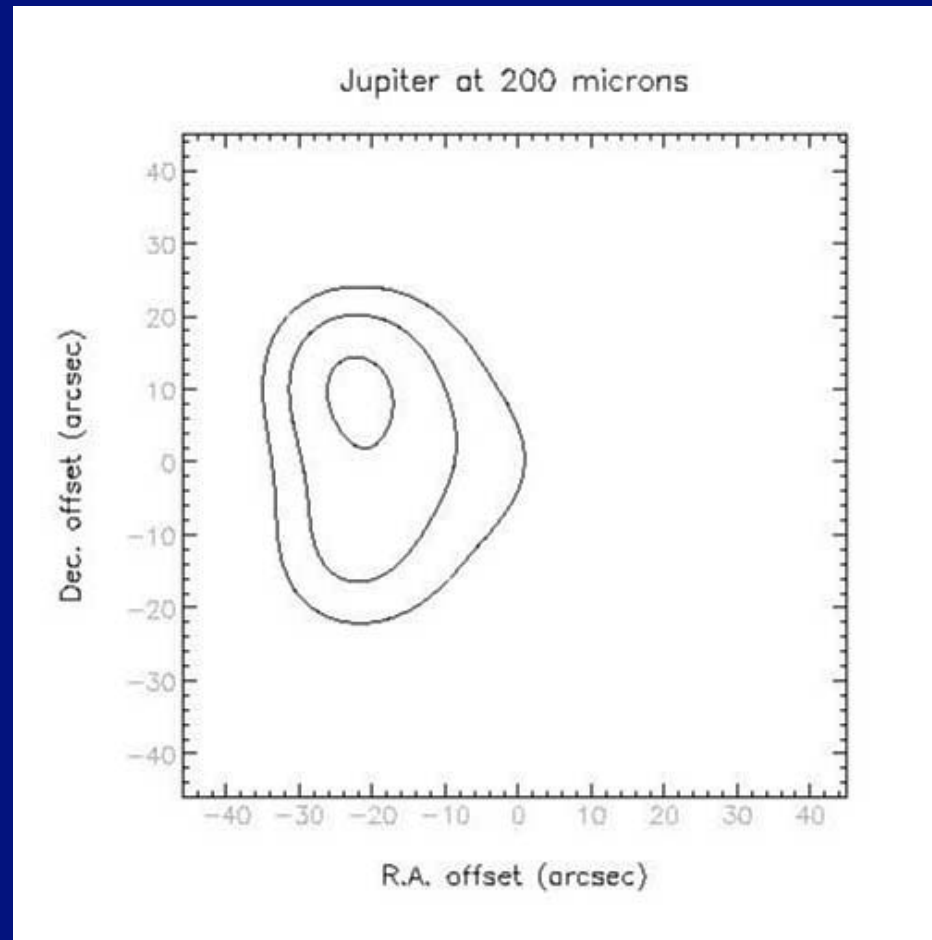
Previous measurements (South pole)



$$\text{Tau}(1500) = (100 \pm 20) * \text{tau}(225)$$

**The TREND team (Gerecht et al, 2003, 14th THz ISS;
Chamberlin et al 2002, SPIE, 4855-83)**

First Thumper data - map of Jupiter



Ward-Thompson et al 2005 MNRAS 364, 843

CCAT:

- Would continue the UK's interest in wide-field sub-mm astronomy through the next decade
- Would allow us to build on our JCMT SCUBA-1 & 2 expertise
- Would give us 2-4 arcsec resolution over very wide fields - rather than the current 14 arcsec
- Would give us access to wavelengths where prestellar cores and protostars emit most of their energy