Imaging Diagnostics for Transitional Discs

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Recent imaging observations of transitional discs have revealed that in some targets, the gap measured using sub-mm "disappears" when observed using near-Infrared polarimetry, suggesting that the "empty" region is actually filled with small particles of dust.

Assuming the gapped structure observed in transitional discs is caused by the presence of a planet, we try to explain such discrepancies simulating observations of physical models of disc-planet systems with SPHERE-ZIMPOL, HiCIAO, VISIR and ALMA.

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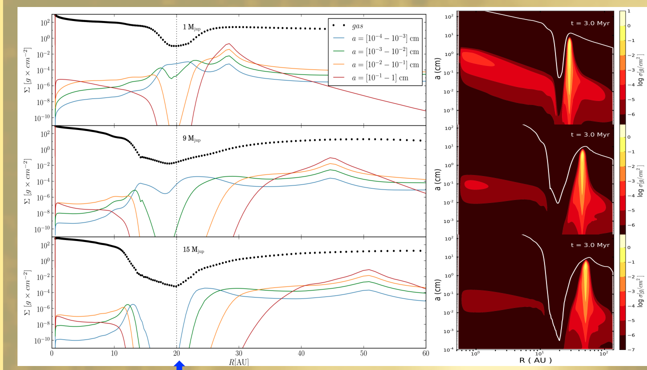


- **3 Myr old disc hosting a planet of:**
  M_p = [1,9,15] M_{jup} at R_p = [20,40,60] AU
- **Combining 2-D hydrodynamical and dust evolution simulations we obtain the distribution of gas and dust**
- **The planet generates a pressure bump in the gas distribution. Large dust grains accumulate in the bump, while small grains flow with the gas to the inner regions (Pinilla et. al. 2012a)**

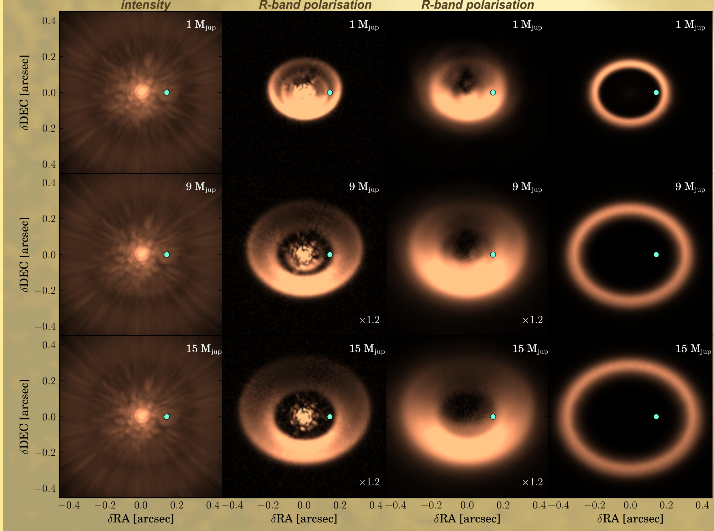
SPATIAL SEPARATION OF DIFFERENT GRAIN SIZES

- **MCMax computes scattered and emission full resolution images at wavelengths:**

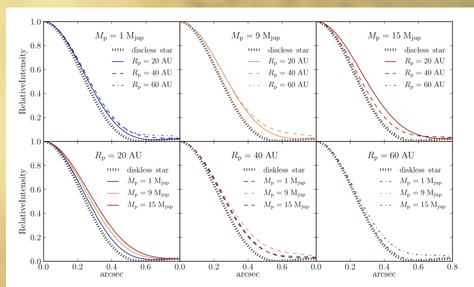
λ = [0.65, 1.6, 20,850] μm

Planet at 20 AU

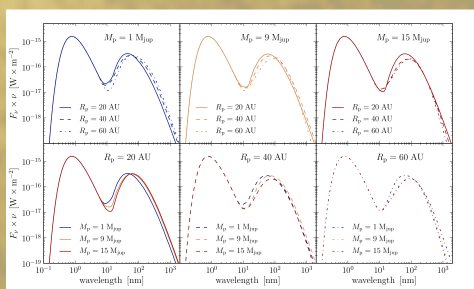
ZIMPOL *intensity* | **ZIMPOL** *R-band polarisation* | **HiCIAO** *R-band polarisation* | **ALMA**



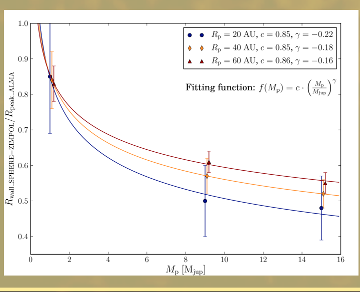
Q-band



SEDs



position of $ZIMPOL_{WALL}$ / position $ALMA_{PEAK}$



1. **A planet generates a spatial separation of dust grain sizes that depends on the mass & separation of the planet.**
2. **Visible and NIR imaging polarimetry detects the small grains while sub-mm traces the "trapped" ~1 mm grains**
3. **ZIMPOL + ALMA = tight constraints on mass & separation**
4. **ZIMPOL + mid-infrared = constraints on mass & separation**