Star & planet formation parallel session – Herschel Conference Wrap-up

Derek Ward-Thompson
University of Central Lancashire

October 18th, 2013
Some quotes of the week:

‘Your standard calibrators are variable’ – Cernicharo
‘I’m an alcoholic, I like methanol’ – Pestalozzi
‘I was locked out of the hotel’ – Oliver
‘I’ve got the water covered’ – Bergin
‘You’ll have to change your research goals’ – Eales
‘I can go into the Tate Modern and explain stuff’ – Bendo
‘Andromeda is like the girl next door’ – Ford
‘When water gets cold you can skate on it’ – van der Tak
Herschel’s view of the Horse-head

Schneider et al; see also HOPS - Megeath et al
Horsehead Nebula

W-T et al
The initial conditions of star formation

Hogerheide et al
Launhardt et al.
L1495

W-T et al
Gould Belt survey (Andre et al)

Konyves et al

Aquila – 3x3deg – R:500, G:170, B:60um – 15 other such regions in survey
A young cluster forming

Konyves et al
Prestellar/Starless CMF in Aquila

Konyves et al;
Andre et al
Polaris

W-T et al
Miville-Deschenes et al
Herschel Infrared Galactic Plane Survey

SPIRE 250-500 microns

PACS 70, 160 microns

Molinari et al; Pestalozzi et al
Galactic centre loop

Molinari et al
CMF/PDF mimics IMF

Andre et al

Motte et al

Henning et al

Schneider et al
In Aquila, the prestellar cores with ON- / OFF-filament position do not seem to show evidence of different peaks in the CMF.

⇒ This feature can be environment dependent...
Core lifetime estimates

Based on number ratios:

- ~400 *Herschel* prestellar cores
  \( t \sim 1 \text{ Myr} \)
- ~200 *Herschel* Class0/ClassI protostars
  \( t \sim 0.5 \text{ Myr} \)
- ~800 *Spitzer* (Class II, YSOs)
  \( t \sim 2 \text{ Myr} \), Evans et al. 2009

Estimates of *Aquila* core lifetimes lie between two “extreme” timescale evolutionary models.

Literature estimates for observed core timescales of various data-sets gave similar constraints (Jessop & Ward-Thompson 2000, Ward-Thompson et al. 2007, references therein).
Konyves et al

HGBS: AQUILA

MASS-SIZE DIAGRAM

Aquila: Mass vs. size diagram comparing the locations of ~400 candidate prestellar cores (▲), and the rest starless cores (△) (André et al. 2010, Könyves et al. 2010).

Taurus: mass-size diagram appears to serve as an evolutionary diagram (André et al. PPVI).

Könyves et al., in prep.

Kirk et al. 2013
Filament growth

Andre et al; Palmeirim et al
Filaments everywhere!

Schneider et al
Cores form on filaments

Konyves et al
Fomalhaut – PACS 70um

Acke et al; Sibthorpe et al; Phillips et al; Donaldson et al
Towards a unified model...
Conclusions

• A new paradigm has emerged from Herschel
• Clouds rapidly become filamentary
• Filaments form cores
• CMF/PDF mimics IMF
  • Log-normal - turbulence
  • Power-law - gravitation
  • Second power-law – compression(?)
• Towards a unified model of star formation…..