Star formation in the Rosette molecular cloud under the influence of NGC 2244

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Introduction

The Rosette nebula has a spectacular morphology because the central OB cluster NGC 2244 has blown a circular-shaped cavity into the molecular cloud that is now interacting with the expanding HII-region. This source was selected for observations with PACS (70 and 160 µm) and SPIRE (250, 350, 500 µm) during the Science Demonstration Phase in the context of the HOBYS* keyprogram.

Is star-formation triggered in Rosette ?

Studying the spatial distribution of the most massive dense cores (size scale 0.05 to 0.2 pc), we find an age-sequence (more evolved to young) with increasing distance to the cluster NGC 2244. No clear gradient is found for the clump (size-scale up to 1 pc) distribution. A larger statistics is required to arrive to a firm conclusion whether star-formation in Rosette is triggered or not.

Results

The three-color image (Fig a) shows impressively how the molecular gas is heated by the radiative impact of NGC 2244. A clear *negative temperature gradient* (Fig. b) and *a positive (column) density gradient* (Fig. c) running from the HII-region/ molecular cloud interface into the cloud are detected.

Star-formation in pillars

Fig. d) shows that cold, dense clumps survive in the strong UV field in the interface region. It is due to heating and thus the increasing pressure of the lower-density interclump gas that primordial, denser clumps are even more compressed forming pillar-like structures that point towards the source of radiation. In the high-density tip of the pillars, star formation takes place (see Gritschneder et al. 2009 for hydrodynamic models).

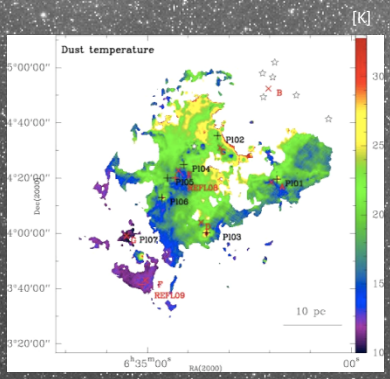

Fig. b) Dust temperature map, obtained from simultaneously fitting the 5 observing wavebands of PACS and SPIRE. Black crosses and labeling 'PL' indicate the position of the clusters identified by Phelps & Lada (1997), red crosses and labeling A,B, etc. the ones from Poulton et al. (2008)) and labeling REFL the ones from Roman-Zuniga et al. (2008).

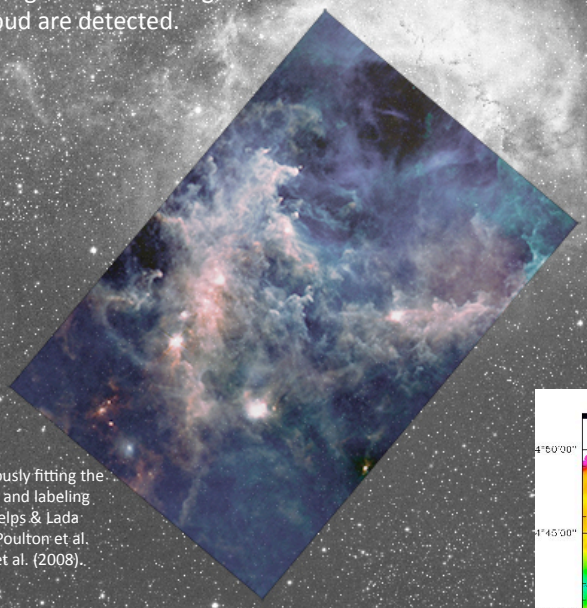

Fig. a) Three color image (70 µm=blue, 160 µm=green, 500 µm=red) of Rosette, overlaid on an optical image (Hα from the Digital Sky Survey).

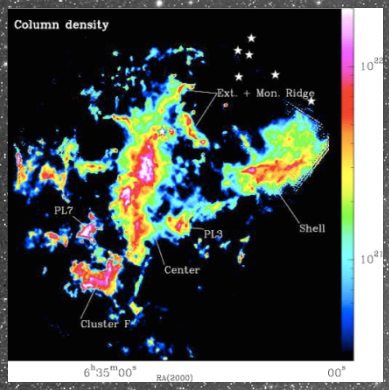

Fig c) Molecular hydrogen column density [cm^{-2}] in logarithmic scaling determined from the same greybody fit that was used for the temperature

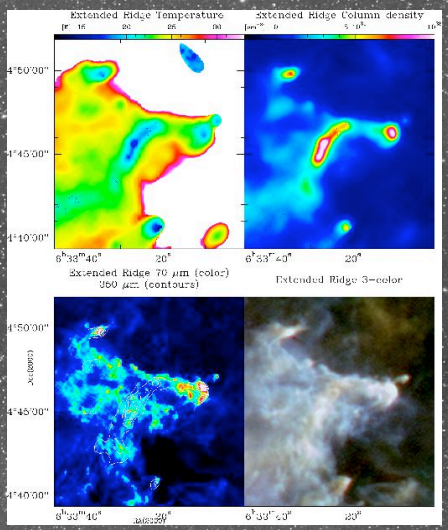

Fig. d) Zoom into the interface region (Extended Ridge, Schneider et al. 1998). Note the star-forming high-column density tips of the pillars, shaped by external UV radiation.

Literature:
Gritschneder M. et al., 2009, ApJ, 694, L26
Phelps R. & Lada E.,1997, ApJ 477, 176
Poulton C., et al 2008, MNRAS, 384, 1249
Roman-Zuniga C., et al. 2008, ApJ, 672, 861
Schneider N., et al., 1998, A&A, 335, 1049

*HOBYS is the Herschel imaging survey of Young OB stellar objects (Motte, Zavagno, Bontemps et al.) http://starformation-herschel.iap.fr/hobys