Infrared Processing and Analysis Center

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Herschel Space Observatory and The NASA Herschel Science Center at IPAC

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Implementing "Portals to the Universe" Report

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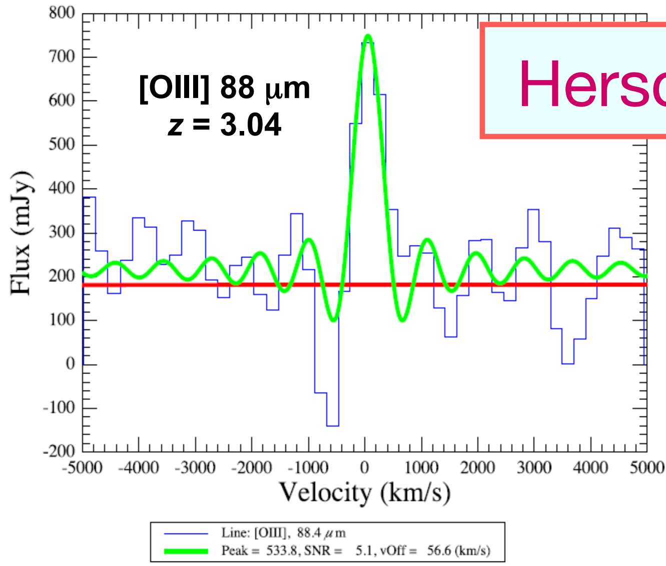
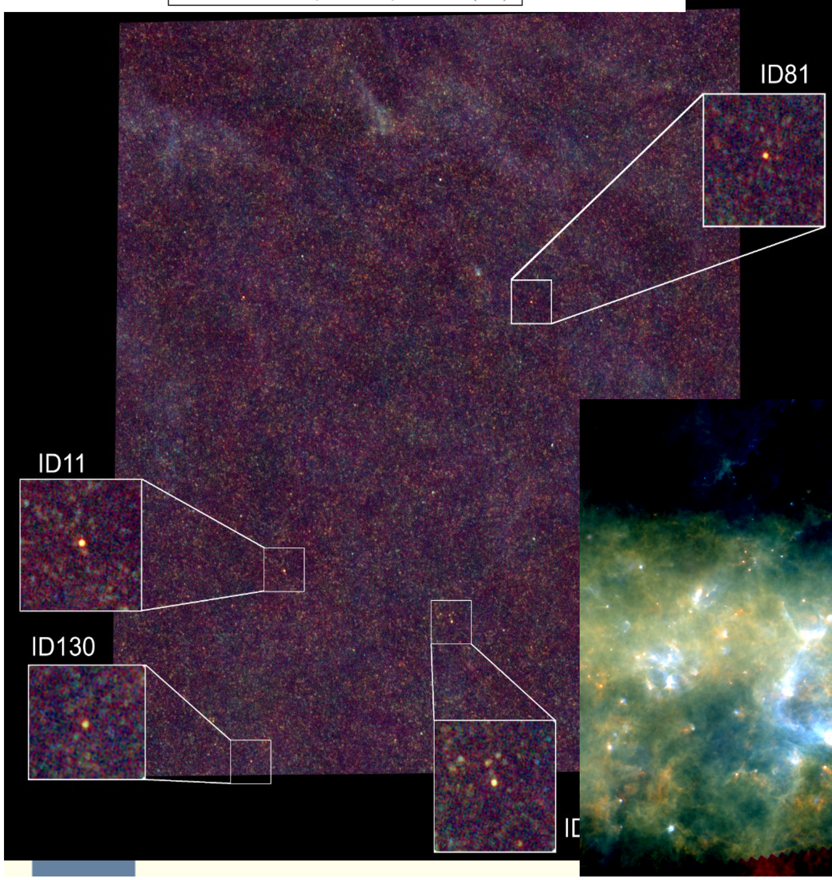
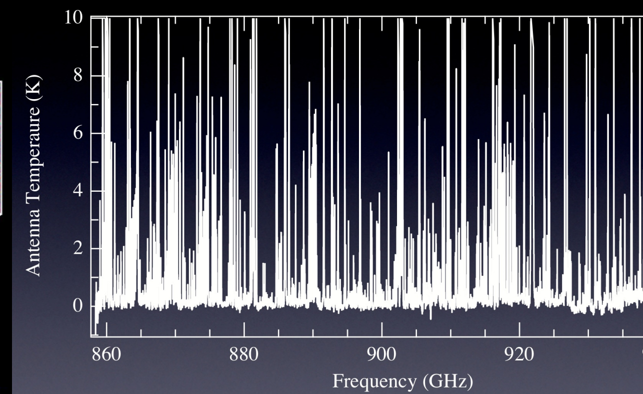
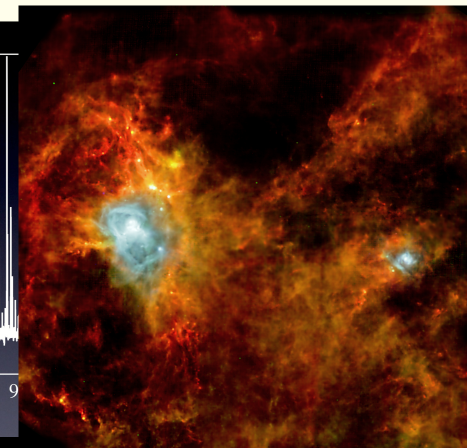
Herschel: Cornerstone FIR/Submm Observatory

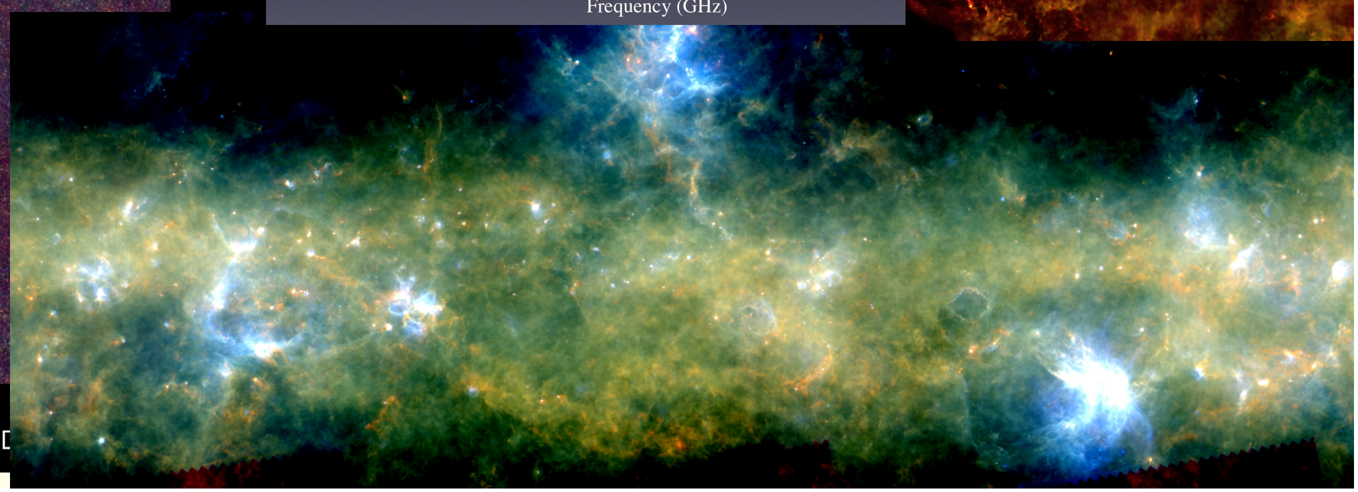
- Three instruments: imaging at {70, 100, 160}, {250, 350 and 500} μm; spectroscopy: grating [55-210]μm, FTS [194-672]μm, Heterodyne [157-625]μm; bolometers, Ge photoconductors, SIS mixers; **3.5m primary at ambient T**
- ESA mission with significant NASA contributions, May 2009 – February 2013 [+/-months] cold











Herschel Mission Parameters

- Userbase
  - *International; most investigator teams are international*
- Program Model
  - *Observatory with Guaranteed Time and competed Open Time*
  - *ESA "Corner Stone Mission" (>$1B) with significant NASA contributions*
  - *NASA Herschel Science Center (NHSC) supports US community*
- Proposals/cycle (2 Regular Open Time cycles)
  - *Submissions run 500 to 600 total, with >200 with US-based PI (~x3.5 over-subscription)*
- Users/cycle
  - *US-based co-Investigators >500/cycle on >100 proposals*
- Funding Model
  - *NASA funds US data analysis based on ESA time allocation*
- Default Proprietary Data Period
  - *6 months now, 1 year at start of mission*

Best Practices: International Collaboration

- Approach to projects led elsewhere needs to be designed carefully
  - *NHSC Charter remains firstly to support US community*
  - *But ultimately success of THE mission helps everyone*
  - *Need to express "dual allegiance" well and early to lead/other centers*

- NHSC became integral part of the larger team, worked for Herschel success, though focused on US community participation
  - *Working closely with US community reveals needs and gaps for all users*
  - *Anything developed by NHSC is available to all users of Herschel*
  - *Trust follows from good teaming: E.g. NHSC scientists contributed half the technical reviews of proposals*

- Mantra of "learn by helping" was seen by all as win-win
  - *NHSC helps with tasks that generate insight into instruments, software, workings of system; NHSC staff spent time with Instrument Teams and ESA Science Center as members of the team*
  - *That insight proved essential to effective user support*

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Best Practices: User Support Targeting

- User Support has different emphases at different mission phases

- Need to target messages, medium, mode of support to each phase
  - *Start early to make sure potential users understand how to use it*
  - *Provide same tools for the whole spectrum of users, GTO - GO – Archival*
  - *Talk to non-GTO early: they will have different takes and needs*
  - *Aim support at non-specialists: the whole community is potentially interested, if properly engaged, and will enrich the science*

- Herschel payoff was high access for US community (48.5% of time)
  - *NHSC User Support model was ahead of EU effort, especially pre-Launch, because more resources were available for it*
  - *NHSC worked with HSC to deploy model in EU, e.g. Data Analysis Workshops*

- User surveys using mail-in questionnaires, informal data gathering

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Best Practices: User Support Evolution

- Example #1: As US-based Herschel users grew in number, the model of hosting teams to support their data analysis became unworkable
  - *Success rate of US PI and co-I teams was 2-3x anticipated rates for "Key Projects," OT1, OT2*
- NHSC response:
  - *Organize hands-on data reduction workshops, 20-40 participants each*
  - *Take those sessions onto the web with webinar technology*
  - *Schedule remote help sessions, and provide self-paced web-tutorials*

- Example #2: Hardware requirements for reducing large data sets exceeded by far anticipated sizing, to well beyond what most investigator teams could afford to buy
- NHSC Response:
  - *Set up dedicated well-sized hardware to be reserved & used remotely*
  - *A "virtual machine" (private, secure, tailored environment) is deployed for each team for days to weeks, then destroyed*

Best Practices: Build on Other Missions

- From Spitzer:
  - *Observation Planning Tool Spot became H-Spot (now also SOFIA-Spot)*
  - *Team structure within NHSC: Combined scientists + engineers*
  - *User interactions: Start Panel early, diversify it, listen hard in other forums!*
  - *Data Analysis Funding scheme and policies: RSA, formulas, priority levels for uncertain cryo-mission duration*
- ISO
  - *Collaboration model: "learn by helping"*
  - *Resident US Astronomer at Herschel Science Center*
  - *Background estimator, other tools adapted for Spitzer, then for Herschel*
- IPAC environment, team member progression to new projects help
  - *New missions still need to work hard at not re-inventing the wheel*

From *Portals to the Universe: The NASA Astronomy Science Centers* (NRC Report, 2007)

"Successful research using archival data sets is dependent on the resident expertise and corporate memory that resides at the science centers."