

Kriging in Astronomy

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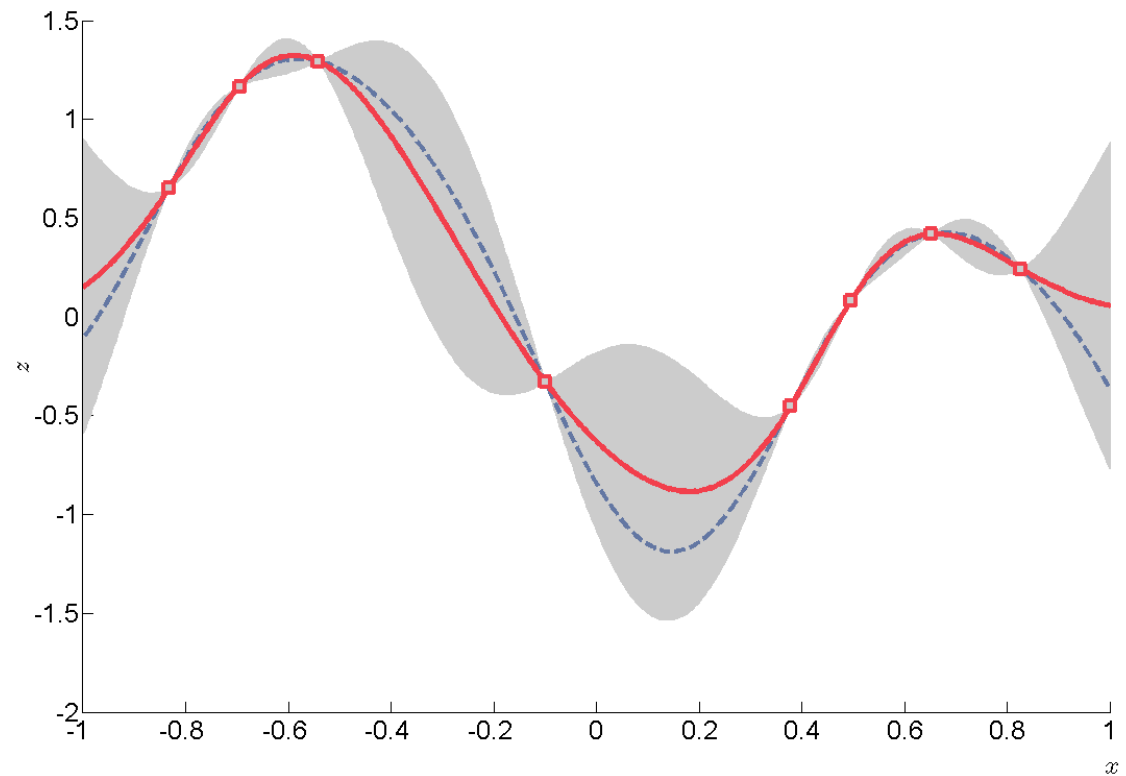
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What is Kriging?

- The basic idea



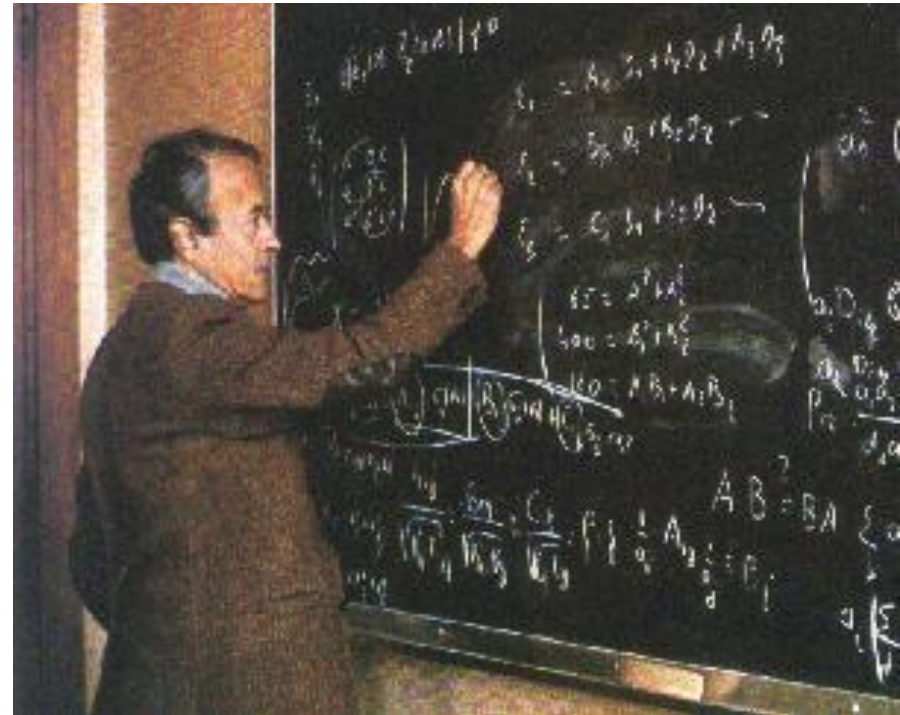
What is Kriging?

- The basic idea
- The inventor:
Daniel Gerhardus Krige



What is Kriging?

- The basic idea
- The inventor:
Daniel Gerhardus Krige
- The developer:
Georges Matheron

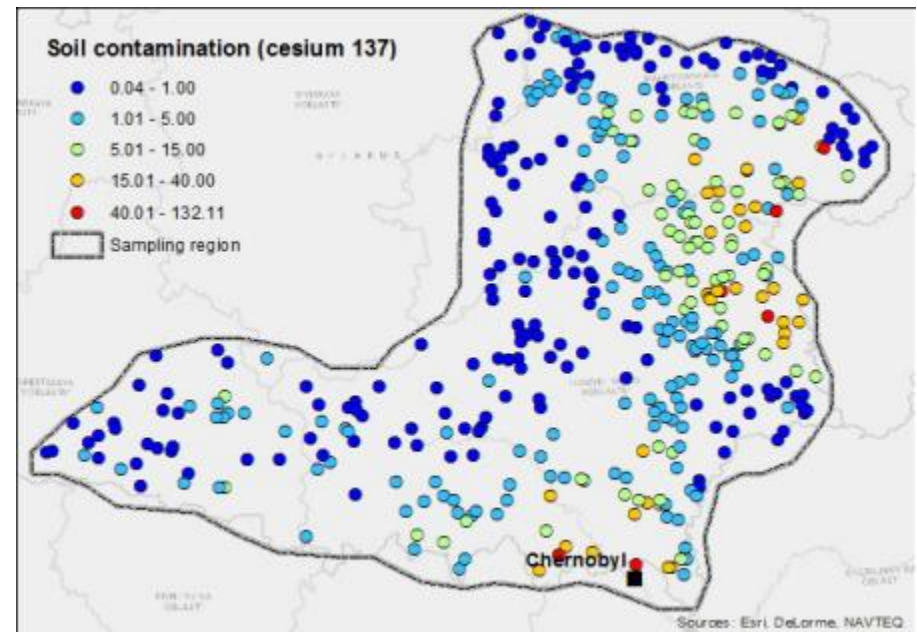


Kriging in diverse disciplines

- Geostatistics
 - Hydrology
 - Hydrogeology
 - Meteorology
 - Geography
 - Forestry
 - Agriculture
 - Mapping

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Kriging in astronomy

- Kriging interpolating cosmic velocity field
([2015PhRvD..92h3527Y](#))
- Eight-year climatology of dust optical depth on Mars
([2015Icar..251...65M](#))
- Interpolating point spread function anisotropy
([2013a&a...549a...1g](#))

Herschel data

- SPIRE bolometer arrays
 - 326 bolometers
 - 3 observed wavelength
(250, 350, and 500 microns)
- SPIRE processing pipelines

Herschel data reprocessing

- Timeline (level1) merging
- Level2 mapmaking with destriping
- Zero point calibration

Source extraction

- Direct search with HIPE
 - Sussextractor
 - Timelinefitter
- From catalog
 - SPIRE Point Source Catalog

Source extraction

- Point sources
- Slightly extended sources
- Extended sources

Source subtraction

- HIPE
 - from level1 timeline

- Kriging
 - from level2 calibrated maps

Source subtraction

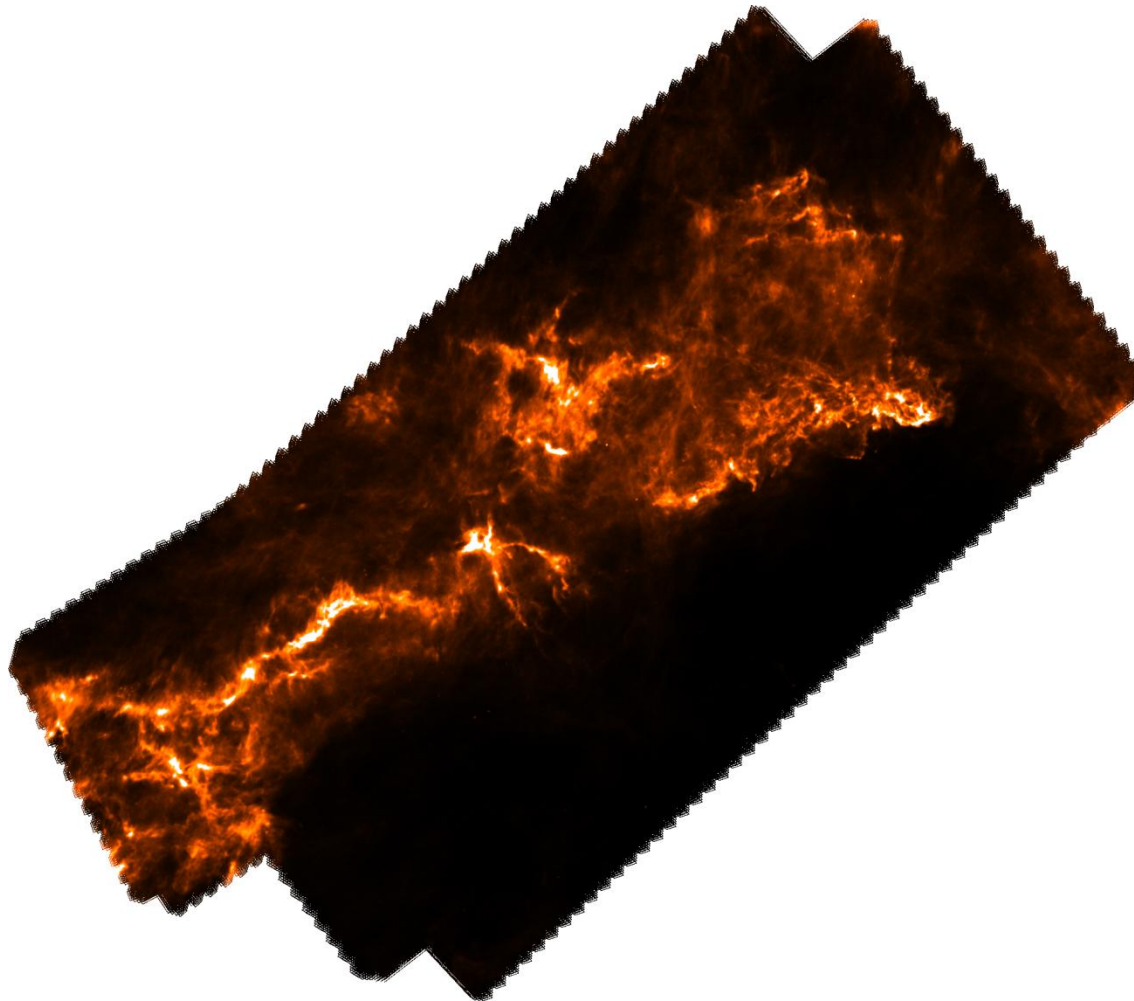
- HIPE
 - from level1 timeline
 - sometimes uses over 40 GB of memory
- Kriging
 - from level2 calibrated maps
 - less than 2 GB of memory

Source subtraction

- HIPE
 - from level1 timeline
 - sometimes uses over 40 GB of memory
 - >4 days running time
- Kriging
 - from level2 calibrated maps
 - less than 2 GB of memory
 - <1 day running time

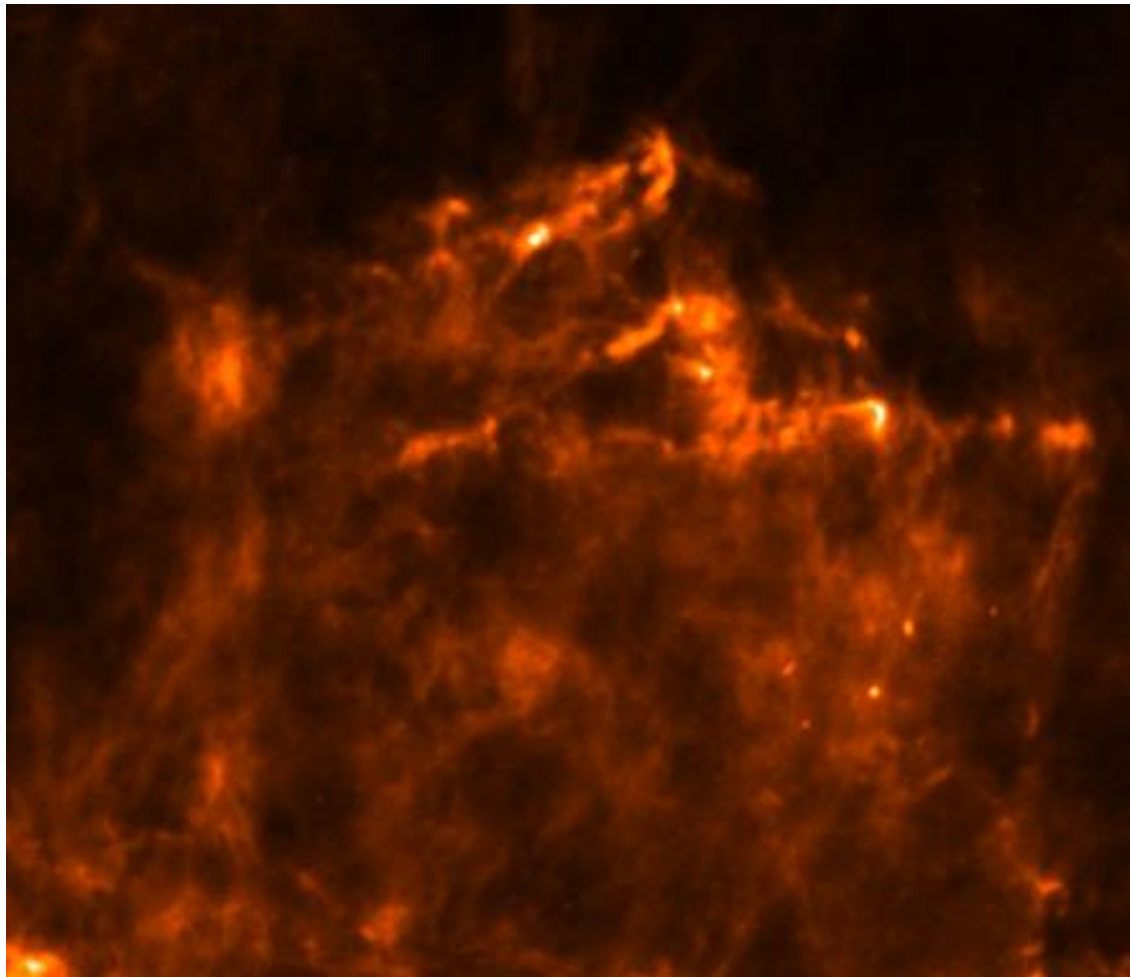
An example

- Input map with point sources: G163.82-8.32 (v31 7420)



An example

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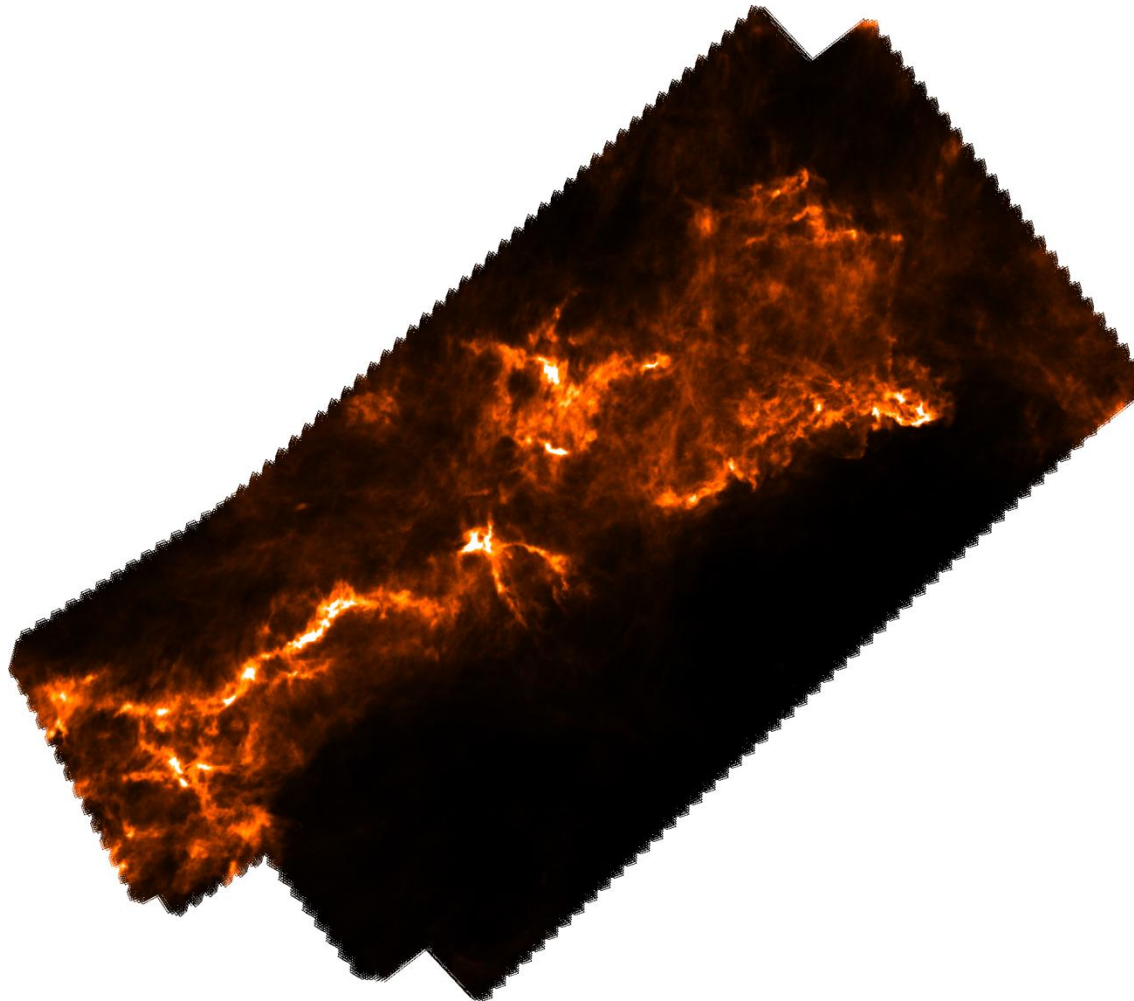


An example

- Map created from 4 observations
- Sources found:
 - PSW 3300
 - PMW 3200
 - PLW 1600
- Sources masked
- The areas were Kriged

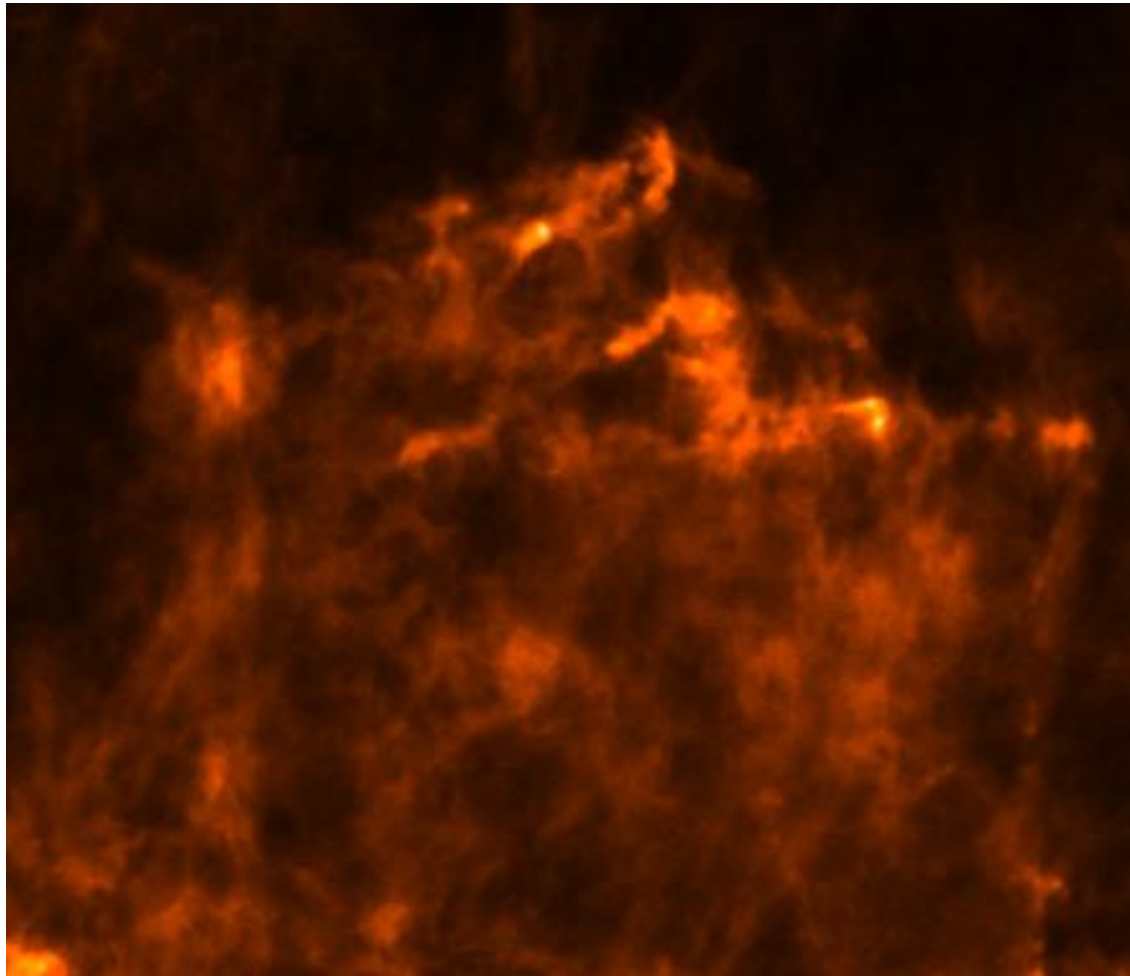
An example

- Output map without point sources

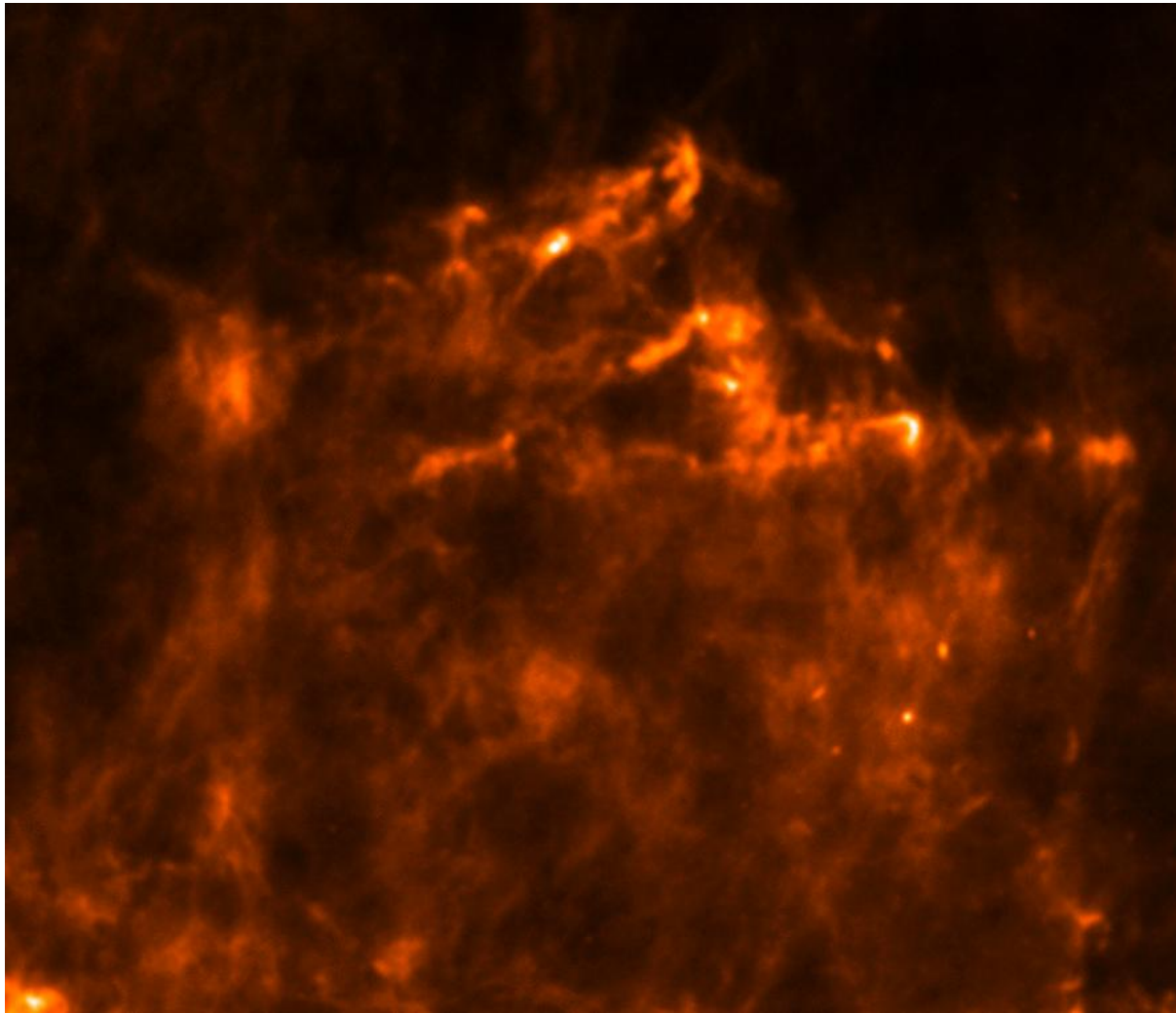


An example

- Output map without point sources



An example



Discussion

- To measure the interstellar medium we need to remove the flux from point sources
- I have found a way to remove the point sources much quicker with much less resources than the prewritten task in HIPE