

# Solar radio emission surveillance by the Trieste Solar Radio System 2.0

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- Solar Radio Weather

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- Conclusions

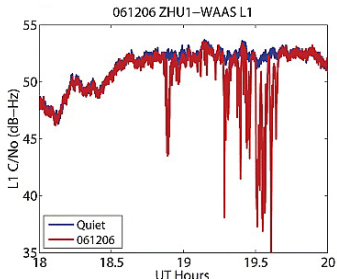
# Solar Radio Weather

- The Sun is a radio noise source
  - broad-band
  - non-directional
- Solar Radio Bursts (SRBs)
  - Enhanced solar radio flux by several orders of magnitude which persists for minutes to hours depending on the solar activity level
  - Extreme Space Weather Events
- SRBs can affect
  - Global Navigation Satellite Systems (GNSS, GPS)
  - WAAS
  - SATCOM
  - Radar
  - Mobile communications (GSM, UMTS)

# Effects of SRB on GNSS

## GNSS

- Satellite-based positioning, navigation and timing system (e.g. GPS, GLONASS)
- RHCP L band (1.1. - 1.6 GHz) signals at two frequencies
  - L1 (1575,42 MHz)
  - L2 (1227,6 MHz)
- Effects of RHCP SRBs in the L bands
  - Intense RHCP SRBs in the L band can be a potential threat to systems based on GNSS through direct radio wave interferences and significant GPS performance degradation. (e.g. Afraimovich et al. 2008)
  - Reduction of the carrier-to-noise (C/N0) of GNSS
  - Instantaneous or long period loss of lock (LOL) on GNSS signals



Needs of diachronic observations of the Radio Sun by dedicated Solar Radio Instruments with accurate Radio Flux and full circular polarization measurements



# Trieste Solar Radio System 2.0

It is a Solar Radio Polarimeter fully devoted to Continuous Solar Radio Weather surveillance:

- Solar Radio Flux density measurements



- INAF Trieste Solar Radio Weather Centre (TSRWC)
- Part of the forthcoming INAF National Space Weather Service Network (INAF NSWSN)

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- Solar Radio Flux density measurements
- Full circular polarisation measurements
  - Solar Radio Physics diagnostic tool (plasma characteristics at the radio emission source, radio emissions, radio emission mechanisms and propagation effects such as plasma structures, reflections, diffusive processes, Faraday rotation and so on.
  - For operations and monitoring purposes in the L-band, it allows to discriminate between RHCP and LHCP radio events and to identify the potential impact to aviation and GNSS-based services of a solar radio burst interference



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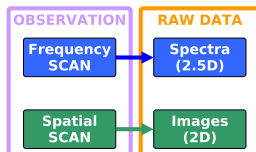
It is a Solar Radio Polarimeter fully devoted to Continuous Solar Radio Weather surveillance:

- Solar Radio Flux density measurements
- Full circular polarisation measurements
- 1-19 GHz Band (L, 2800 MHz, C and Ku-bands)
- Two observation modes:
  - Frequency Scan
    - LHCP+RHCP solar radio spectra
  - Spatial Scan
    - full disk synoptic solar radio images (synergy with SunDish project)

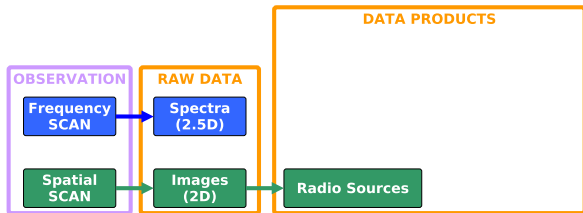


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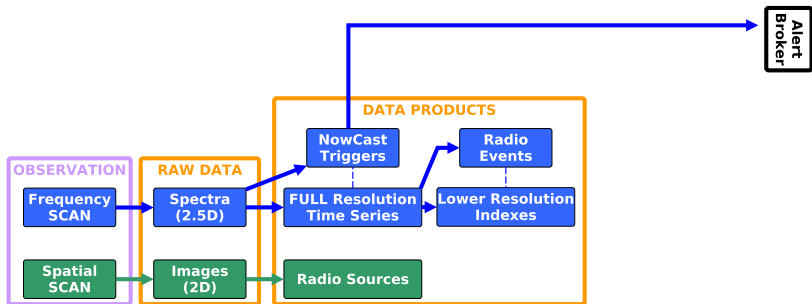
# Data Flow Archive Architecture



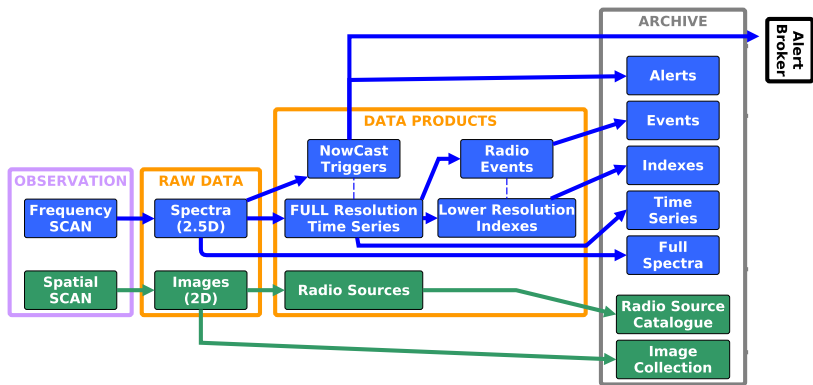
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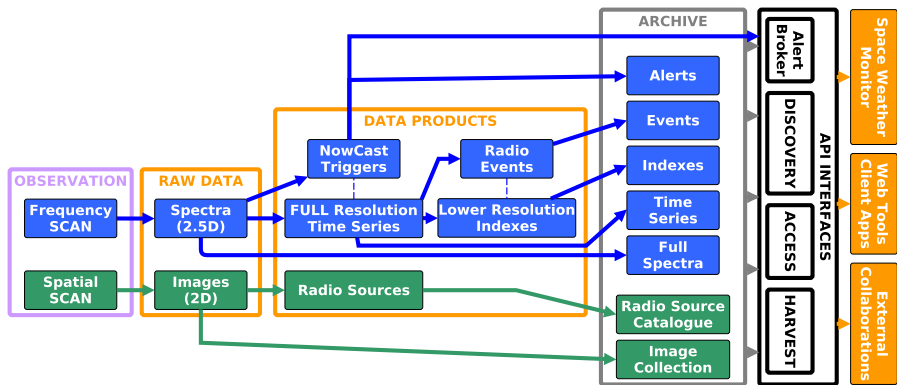


# Data Flow Archive Architecture









# Data Flow Archive Architecture



# Conclusions

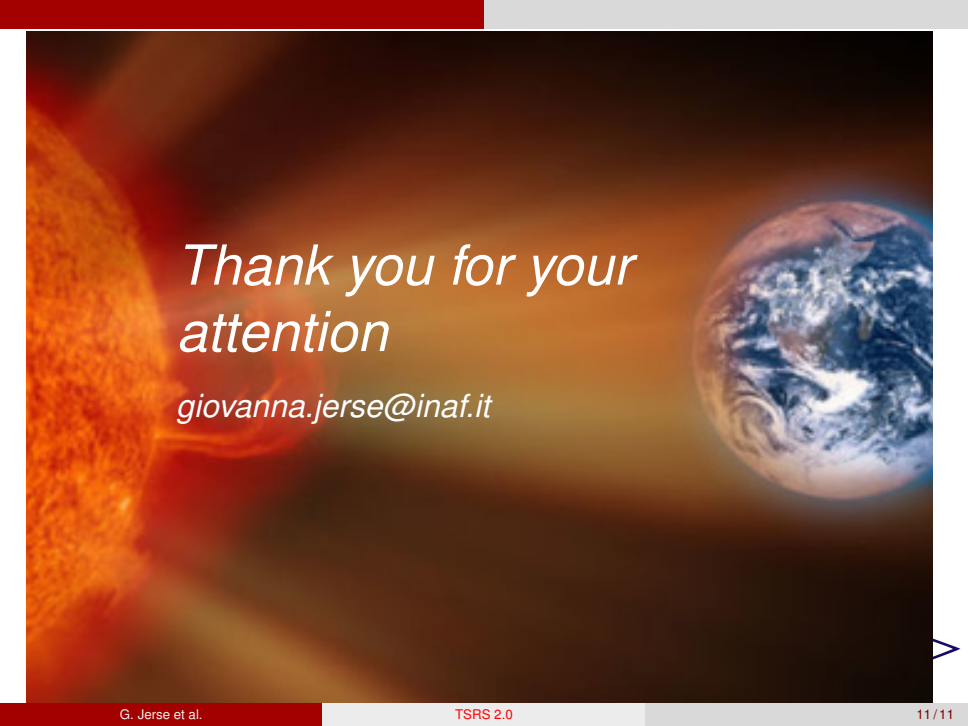
- The Trieste Solar Radio System 2.0 (TSRS 2.0) is the project for a new, state-of-the-art solar radio polarimeter primarily devoted to the solar radio surveillance.
- TSRS 2.0 will play a fundamental role not only in the Space Weather Science but also in the Space Weather operations.
- It will provide radio diagnostics relevant to Space Weather applications by solar radio indices derivation, forecasting and publication tools in near real time.

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*Thank you for your  
attention*

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