
ASTRON

General Big Science Industry afternoon

Wiebe van Breukelen

September 2th 2026, Nijmegen



Exploring the universe

- ASTRON is the Netherlands Institute for Radio Astronomy, and is part of NWO-I.
- *Our mission is to make discoveries in radio astronomy happen.*
- *We do this by developing new and innovative technologies, operating world-class radio astronomy facilities, and pursuing fundamental astronomical research.*

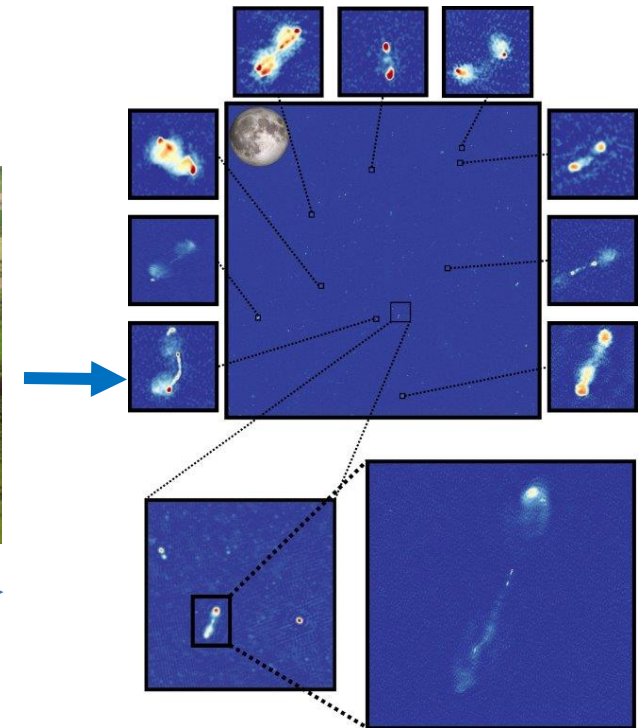
Timeline



1956: Dwingeloo Radio Telescope

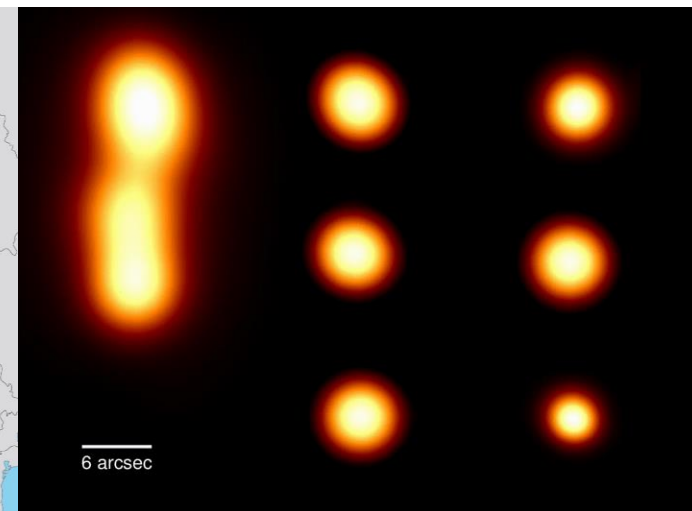
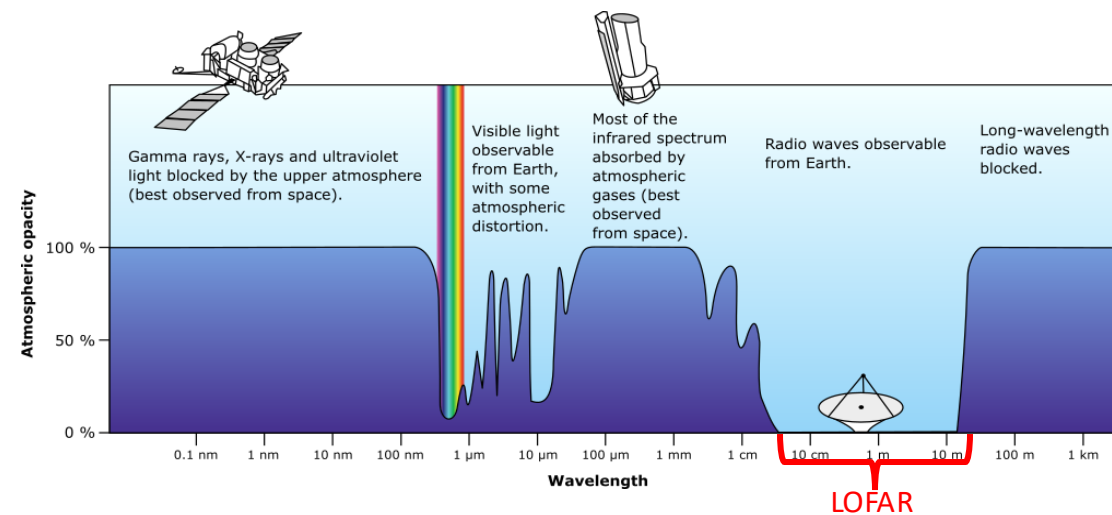
1970: Westerbork Synthese Radio Telescope

2012: LOFAR (*Low Frequency Array*)



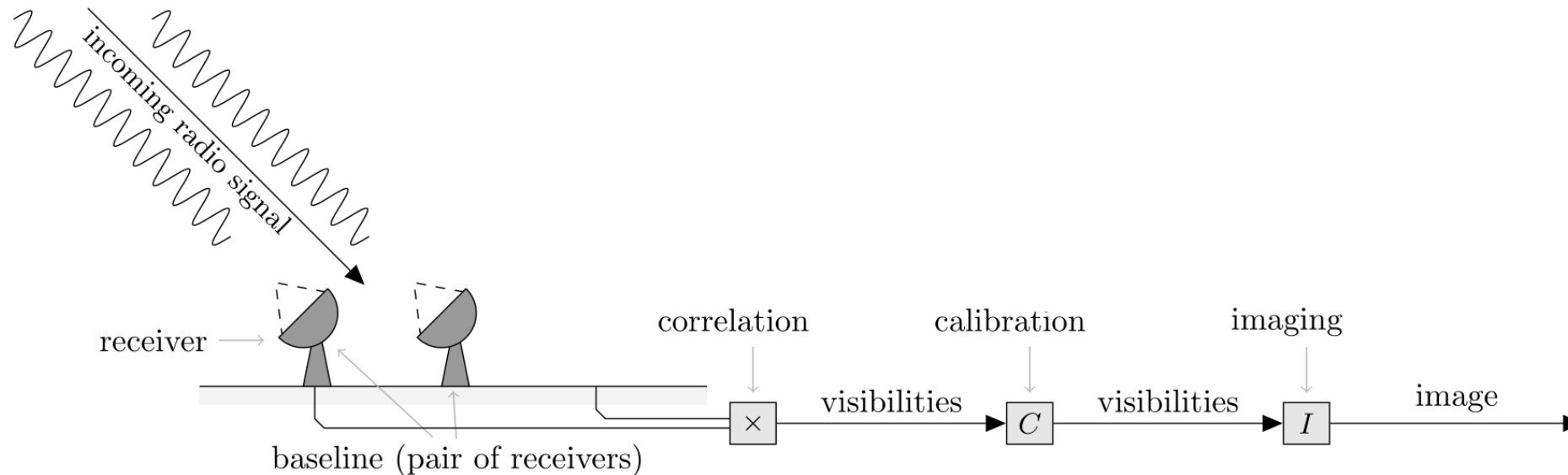
Our largest instrument: LOFAR

- **LOFAR:** *Low-Frequency Array*
- Observing between 10 MHz – 240 MHz
- Spread across all of Europe, together forming the largest radio telescope in the world



Telescopes as software-defined instruments

- Traditional telescopes: dish, receiver
- Now: **arrays of antennas**, digital backends, and software pipelines
- ASTRON focuses on both **instrumentation** and **data processing**
- Software is central to the telescope: from real-time systems to (offline) processing pipelines



Current: LOFAR2.0 Upgrade

- LOFAR 2.0, roll out in progress
 - **Major upgrade to improve sensitivity**
 - Increases data volume and processing demands
- Upgrades at station (hardware) and software level
 - ASTRON-built **Uniboard 2** processing board spread across 75 antenna fields, totaling over 1200 FPGAs
 - **GPU**-based correlator and processing pipelines (> 1 TBit/s throughput)

Lots of challenges across the analog and digital domain!



Sustainability at ASTRON

Morag Brown