

Strap on your Boötes: The Journey to Achieve Widefield Sub-arcsecond Resolution with LOFAR

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Recent technological developments have allowed radio surveys to go deeper than ever before. One such example is the International LOFAR Telescope (ILT). With the first data release of the LOFAR Two-meter Sky Survey (LoTSS) Deep Fields, we have access to 6" radio images at 144 MHz with sensitivities down to 20 μ Jy/beam, which was previously unprecedented at such low frequencies. This is just the tip of the iceberg to what can be achieved using the ILT. The current Deep Fields data release uses only the Dutch stations, despite having data recorded from the international stations. By incorporating the international stations, we can improve the resolution by a factor of 20 moving down to sub-arcsecond resolution, all the way to 0.3".

With the publicly available pipeline (Morabito et al. 2022), it is becoming more common to produce these sub-arcsecond resolution images of individual sources. It is also possible to produce a widefield image at this resolution covering the whole field of view and containing thousands of sources, but this technique is challenging. To date, there is only one fully imaged field, the Lockman Hole, at sub-arcsecond resolution in the literature (Sweijen et al. 2022).

In this talk, I will discuss the challenges that are faced when producing a widefield high resolution image with the ILT. This includes having to correct for differential ionospheric effects across multiple square degrees and starting self-calibration without knowing the source structure. I will present the first sub-arcsecond image of Boötes to demonstrate the scientific potential of such widefield high resolution images.

keywords

LOFAR, High Resolution, Deep Fields, Sub-Arcsecond, Radio Imaging

In-person or online?

in-person

Career level

Student

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