



Contribution ID: 37

Type: **not specified**

Life-cycle of radio galaxies seen by LOFAR

Thursday, 19 September 2019 14:30 (20 minutes)

Supermassive black holes at the centre of galaxies can cycle through periods of activity (in this phase known as active galactic nuclei, AGN) and quiescence. Quantifying the duty cycle of AGN is crucial for understanding the energetic impact they have on the host galaxy. In radio AGN this duty cycle can be investigated by using the characteristics of the radio spectrum and the morphology of the radio emission. The low radio frequencies can be used as fossil record to trace the oldest populations of particles. We have used deep LOFAR images of the Lockman Hole extragalactic field to select a sample of objects in the restarting phase of this cycle.

In this talk, I will present samples of candidate remnants and restarted radio galaxies that we selected using criteria based on the core prominence and the spectral index. I will discuss their radio properties and the optical properties of their host galaxies, as well as their rate of occurrence, which provides fundamental information for understanding the duty cycle of radio sources. The results will be discussed in the context of models of the evolution of the radio sources that we are developing.

The methods for the identification of remnant and restarted radio sources developed for this project will be applied for selecting larger samples in the LOFAR Two-metre Sky Survey.

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Session Classification: Extragalactic jets at all scales: from the central supermassive black hole to their interaction with the large scale environments