AtLAST - The Atacama Large Aperture Submillimeter Telescope

Claudia Cicone*[1], Tony Mroczkowski[2], and Pamela Klaassen[3]

[1]Institute of Theoretical Astrophysics [Oslo] – Norway
[2]European Southern Observatory – Germany
[3]UK Astronomy Technology Centre – United Kingdom

Abstract

Astrophysical observations at (sub-)mm wavelengths allow us to study the cold and dense material in the Universe, hence probing the formation of stars and planets, and the interstellar and circumgalactic medium of galaxies across all cosmic times.
The current generation of 10-m class single dish telescopes delivered the first surveys of the sky at (sub-)mm wavelengths, allowing us to go far beyond the previously optical/IR-biased view of the Universe. Follow-up observations with interferometers then revealed, in exquisite detail, the morphology and kinematics of such (sub-)mm sources, enabling tests and revisions of theoretical models for the formation and evolution of planets, stars, and galaxies.

However, it is now clear that without a step change in the capabilities of single-dish facilities in the 2030s, interferometers (like the ALMA observatory) will soon become source-starved. The current generation of 10-m class single dish telescopes, with their limited field of view, spatial resolution, and sensitivity, can only reveal the 'tip of the iceberg' of the (sub-)mm source population, both for Galactic and extragalactic studies. These limitations cannot be compensated for by interferometers, which are all intrinsically affected by a low mapping speed and by the loss of diffuse extended signals.
The Atacama Large Aperture Submillimeter telescope (AtLAST) project is a concept for a 50m -diameter single dish observatory to be built on the Chajnantor Plateau in Chile. With its large field of view (the goal is _˜ 2 degrees diameter), high spatial resolution (up to _˜1.5" at 350 μm), and sensitivity to both point sources and large-scale structures, AtLAST will be transformational for all fields of Astronomy in the 2030s. Funded by an European Union's Horizon 2020 research and innovation grant, we are performing a full feasibility study and telescope design for AtLAST that takes into account the technical, operational, environmental, and managerial challenges of such new international infrastructure, at the same time ensuring that it can achieve the ambitious transformational science goals identified by the astronomical community.

*Speaker