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OPAL: HPC codes and simulations to unveil the Origins of Planets for the ArieL space mission.

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The James Webb Space Telescope is allowing the characterisation of planetary atmospheres with a level of detail that exceeds the resolution of current models. With the future launch of the ESA mission Ariel, interpreting the large anticipated volume of such detailed spectra will require a new generation of models and theoretical frameworks. To timely tackle this challenge, we developed and are continuously expanding the *Arχes* suite of simulation codes for astrochemistry and planet formation. In this talk we will present the PNRR Key Science Project *OPAL* whose goals are twofold: 1/ enhance the efficiency and HPC capabilities of the *Arχes* codes and simulation pipelines. 2/ produce an unprecedented library of detailed and physically-justified atmospheric models of planets to support the preparation of the Ariel mission. We will also present the most recent addition to the *Arχes* suite, the planetary GROwth and MIgration Track population synthesis code (*GroMiT*) and its applications in support of the GAPS project at TNG and JWST proposals.

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