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CoreCaster: A Probabilistic Simulator for Ice Drilling Campaign Planning

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Ice core drilling campaigns require careful planning to optimise field operations while continuously refining strategies throughout the season to navigate logistical challenges. CoreCaster is a Python-based simulation tool designed to forecast drilling progress under both idealised and probabilistic conditions. Developed in the field during the Beyond EPICA Oldest Ice Core drilling campaign, CoreCaster utilises probabilistic modelling to simulate individual drill runs, full seasons, and entire drilling campaigns. By iterating these simulations over numerous cycles, the tool generates a range of plausible scenarios, aiding logistical decision-making and contingency planning.

Initial field validation has demonstrated strong alignment between CoreCaster's forecasts and actual performance, reinforcing its potential as a planning tool for future drilling campaigns. CoreCaster can also extrapolate drilling performance for systems without real-world trial data, using input parameters from existing equipment to model expected behaviours in novel setups. While currently implemented as a Python module to be used within scripts, plans for an enhanced interface—including a GUI—would improve usability and accessibility for research teams.

This contribution explores CoreCaster's methodology, validation against real drilling operations, limitations, and potential extensions, including broader integration with other aspects of drilling logistics. By improving planning precision and easing logistical demands, CoreCaster supports more efficient and adaptable ice core drilling campaigns.

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