



## **Imaging, redatuming and interferometry by inversion – toward solving large systems of integral equations at scale**

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In almost every form of processing of multichannel seismic data, the use of numerical integral operators is ubiquitous: they appear in signal processing, interferometric calculations, and are a key component of most if not all imaging techniques such as migration, tomography and waveform inversion. As data sets become larger in volume by the day, and models increase in complexity, the numerical manipulation of these operators becomes paramount, in terms of algorithmic simplicity, reproducibility and computational efficiency. In this talk, using examples of Marchenko redatuming by inversion, we will discuss the numerical aspects of representing and solving large systems of integral equations. In particular, by means of our redatuming examples, we will focus on high-level symbolic representations of linear operators, and how such representations enable operations that would otherwise be numerically intractable by more conventional matrix-based operator representations. Finally, we will cover existing open-source libraries that deliver these capabilities, focusing in particular on the recent Python-based PyLops library, and discuss next steps forward for the community in order to achieve large integral-operator calculations at scale.