The large inverse problem of modern radio interferometry

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Résumé

The data produced by the new generation of interferometers are affected by a large variety of partially unknown complex effects such as pointing errors, phased array beams, ionosphere, troposphere, Faraday rotation, or clock drifts. Existing algorithms solve for the effective Jones matrices, and none of them use any of the structural properties of the Radio Interferometry Measurement Equation (RIME) nor can constrain its underlying physical quantities. Another related difficulty is that they lack robustness in the presence of low signal-to-noise ratios, and when solving for moderate to large number of parameters they can be subject to ill-conditioning. Those effects can have dramatic consequences in the image plane such as source or even thermal noise suppression. I will review the existing algorithms as well as those under development, and discuss the impact of this numerical instrumentation on the future science with the SKA.

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