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ORIGINAL ARTICLE

Weighting interferometric data for direct imaging

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Abstract The new generation interferometric arrays such as the Atacama Large Millimeter/submillimeter Array (ALMA) are composed of a large number of telescopes and their configurations are optimized for Fourier plane (a.k.a. *uv*-plane) coverage. As a consequence, solving for the missing information in the *uv*-plane is becoming less critical and the imaging algorithms can be revisited. The situation is getting similar to that encountered with single filled aperture telescopes and it is becoming possible to make images in a direct way. In this article a new weighting method is introduced to obtain "pseudo-clean" images without using prior information to solve for the Fourier transform of the source. This method is similar but not equivalent to the successive application of robust weighting and tapering at different scales. The idea is to weight the data to compensate for the imperfect distribution of natural weights in the *uv*-plane. The price to pay for this direct imaging technique is that the final point spread function (PSF or beam) may not follow a simple analytical shape such as a Gaussian (but this is also the case in optical astronomy) and some sensitivity is lost (but this is the case with any imaging algorithm in interferometry). Two parameters are introduced to control the trade-off between imaging quality and sensitivity, namely a

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