

**Gridded Area-Averaged Daily Precipitation via  
Conditional Interpolation**

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AIACC Working Paper No.15  
July 2005

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## Gridded Area-Averaged Daily Precipitation via Conditional Interpolation<sup>1</sup>

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**ABSTRACT:** A growing need for gridded observational datasets of area-average values to support research, specifically in relation to climate models, raises questions about the adequacy of traditional interpolation techniques. Conventional interpolation techniques (particularly for precipitation) suffer from not recognizing the changing spatial representivity of stations as a function of the driving synoptic state, nor the bounded nature of the precipitation field—that the precipitation field is spatially discontinuous. Further, many interpolation techniques explicitly estimate new point location values, and do not directly address the need arising from climate modeling for area-average values.

A new procedure, termed conditional interpolation, is presented to estimate daily gridded area-average precipitation from station observations. The approach explicitly recognizes that the point observations represent a mixture of synoptic forcing shared in common with surrounding stations, and a response that is unique to the station. Consequently the spatial representivity of a station is conditional on the synoptic forcing and is a function of the radial direction from the station. The conditional interpolation accommodates this in a two-stage process through conditioning the interpolation parameters as a function of the synoptic state. First, the spatial pattern of wet/dry conditions is estimated, following which the magnitude of the precipitation is derived for those locations determined as “wet.” In a test based on a high-resolution dataset for South Africa the conditional interpolation is very effective in defining the spatial extent of the precipitation field. It then derives gridded values that are representative of the area average. In comparison, both these characteristics appear to be significantly overestimated by one of the commonly used interpolation schemes (Cressman interpolation). Overall the interpolation conditioned by the synoptic state appears to better estimate realistic gridded area-average values.

<sup>1</sup> Abstract reprinted from *J of Climate* 18:41-57 (2005). A full copy of the paper may be requested from Bruce Hewitson: [hewitson@egs.uct.ac.za](mailto:hewitson@egs.uct.ac.za). The paper reports on research supported by grant no. AF07 of the AIACC Project.

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