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A Recommended Specific Definition of "Resolution"

The term, "resolution," has been used in a wide variety of peer-reviewed publications to refer to the grid increment used in a model. For example, general circulation models (GCMs) are said to have a resolution of about 400 km by 400 km, when that scale more appropriately refers to the horizontal grid mesh.

From sampling theory, it is well known, however, that at least two grid increments are required to represent data. Real information at scales smaller than two grid increments are erroneously aliased to larger scales. An illustration of this is presented in Pielke (1984, Fig. 10.7). Models such as GCMs, however, require additional grid resolution to adequately simulate meteorological processes as a result of serious computational inaccuracies at scales less than four grid increments (e.g., see Table 10.1, 10.2, and 10.3 in Pielke 1984). Some investigators suggest even more grid increments are needed for adequate simulations.

Using these clarifications, resolution within a numerical model should refer to at least four times the grid interval. For instance, a GCM with 400 km by 400 km horizontal grid increments would have a resolution of no less than 1600 km by 1600 km. Diagnostic data (e.g., terrain) with sampling at a 400-km interval would have a resolution of no better than 800 km.

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