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GR Focus Review

Uncertainty in the Breakup, Spreading history, and Velocity Variations of Gondwana

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Abstract

There are three major uncertainties in the derivation of plate velocities in general. Firstly, the errors associated with the identification of isochrons and fitting conjugate isochrons. Secondly, various geological choices made in the model that represent the model creator's view of when break-up occurred and how tight the fit was and whether certain isochrons should be part of the reconstruction or not: this I term model uncertainty. Finally, the choice of timescale. While much of the geoscientific community have adopted recent timescale standards, such as GTS16, the smaller plate kinematic community continue to use legacy timescales, typically a composite of KG85 and CENT94. In this paper, I examine these second and third source of uncertainty and show that they can be significant sources of noise in the signal of plate velocities, frequently over 20% of the signal and often as high as 60%. For those seeking to connect plate kinematics, vertical motions and the mantle dynamics, knowing the uncertainties in the kinematic model used is essential.

Introduction

The question of spreading velocities and timescale errors goes right back to the early papers that established seafloor spreading as a mechanism for moving the continents. Having the correct