



Constraining South Atlantic growth with seafloor spreading data

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The opening of the South Atlantic ocean is one of the most extensively researched problems in plate kinematics. Models of it have proliferated since Bullard, Everett and Smith published the first-ever computer-assisted reconstruction in the 60s. General agreement exists about ocean opening being the result of the northward propagating mid-Atlantic ridge, which implies a degree of intracontinental deformation. In view of this, modern studies assign this deformation to narrow deformation belts between large plate-like continental blocks in order to achieve best fits of the blocks' extended continental margins. The geological record of intracontinental deformation constrains the magnitude, orientation, and timing of block motion at very low resolution only. Similarly, the ages and shapes of the extended margins are not unanimously interpretable at high resolution. Aiming to avoid the uncertainties inherent in this approach, we model plate divergence as depicted by seafloor spreading data, and use this model as a context within which to interpret intracontinental tectonic motions.

Our results show that it is possible to explain nearly all available oceanic kinematic data relating to the opening of the South Atlantic in terms of the divergence of only two plates, with seafloor spreading starting at 138 Ma. The motions leading to the assembly of South America by 123 Ma and Africa by 106 Ma are illustrated by an animated tectonic reconstruction. Furthermore, our model puts features such as the Vema Channel, Malvinas plate, NE Georgia Rise and Agulhas Plateau into context, explaining their formation and evolution within the process of divergence of the South American and African plates. Lastly, we examine the implications of our model in terms of the accommodation of spreading-related stresses within the continental interiors. We challenge the view of narrow deformation belts as the sole sites of stress accommodation by showing that such features may only account for around 60