



## Multi-velocity, multi-directional extension in the South Atlantic rift

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Integrated plate kinematic and forward extensional modelling provides new and powerful insights into the evolution of conjugate passive margin systems. The South Atlantic conjugate margins are an ideal laboratory as intracontinental rifting in Africa and South America preceding the opening of the South Atlantic rift allows to quantitatively reconstruct the kinematics of the pre-seafloor spreading extensional phase. We utilise a self-consistent, high resolution plate kinematic model which includes deforming plates to analyse the spatio-temporal evolution of rifting in the South Atlantic and Equatorial rift system and relate our findings to margin geometry and volcanism. We find that the South Atlantic Rift initiates with a slow extension velocity that persists over  $\sim 20$  My followed by rapid plate acceleration whereby the extension rate increases ten-fold during few million years to final sea-floor spreading velocities. Simultaneously, the plate motion vector of the South American plate experiences strong counter-clockwise rotation. We further combine our plate kinematic models with forward numerical models of lithosphere extension to investigate the effects of a multi-velocity, multi-directional extensional history on the dynamics of lithosphere deformation. Our results illustrate the spatio-temporal variability of breakup, extension and margin geometry along the South Atlantic and Equatorial rift systems.