



## **Mantle flow and oceanic crust formation during the opening of the Tyrrhenian back-arc basin**

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The formation of the Tyrrhenian back-arc basin occurred through short-lived episodes of fast spreading alternated with periods of slow rifting. I present results from three-dimensional numerical models of laterally varying subduction to explain the mechanism of back-arc basin opening and its episodic spreading behaviour. Moreover, I explore the consequences of this alternation between fast and slow episodes of extension on the production of new oceanic crust in the back-arc basin.

Results show that the presence of continental plates (i.e. Africa and Adria) nearby the oceanic subduction of the Ionian slab produces localised deformation within the overriding plate and it is, thus, crucial for the opening of the back-arc basin. Moreover, the occurrence of collision results in the formation of two slab windows at the ocean-continent boundaries, which is in very good agreement with what is observed in the Central Mediterranean, nearby the Calabrian slab. During the evolution of the system the trench velocity shows pulses of fast trench retreat that last a few millions of years. This is associated with episodes of more intense melting of the asthenosphere rising at the back-arc basin. Finally, these three-dimensional models are used to track the mantle flow throughout the model evolution and the source of the mantle melting at the spreading centre.