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Rifting, Subsidence and Anomalous Topography Following the Lithospheric Removal in the Western Anatolia-Aegean Sea Back-arc

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The western Anatolia-Aegean region is dominated by back-arc extensional deformations with significant lithospheric thinning, southward sweeping volcanism, and metamorphism. While several geodynamic models (e.g., slab retreat, orogenic collapse) have been postulated to explain the cause of extension and topography, they have only considered each of these mechanisms in isolation. A series of experimental results are tested whether the observed anomalous topography and syn-convergent extension in western Anatolia back-arc are driven through the combined effects of post-lithospheric removal ("hot back-arc") and retreating subduction. For a model pertinent approximation, since the area has experienced notable topographic subsidence and extension, experiments are conducted with an initially localized high thermal anomaly in the back-arc, which may be due to the past removal/delamination of the lithosphere. The results suggest that removed lithosphere and slab retreat can concurrently depress the surface $\sim$ 2 km and can cause $\sim$ 20 km crustal thinning in the extending back-arc in 12 m.y. There is also notable extension/subsidence due to the slab retreat and thermally perturbed back-arc even if the mantle lithosphere has not been removed. On the other hand, only slab retreat models (without back-arc gap and heating) results in minor surface topographic lowering and crustal thinning/extension in the back-arc region. These calculations can also explain why western Anatolia is considerably higher ($\sim$800 m) than the central Aegean although the difference in crustal thickness is a few kms more based on the receiver function studies.