The 'Strip of Fire': A volcanic second front, inboard the West Pacific 'Rim of Fire'

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Intraplate volcanic belts prevail along the West Pacific continental margins. They lie inboard of several seafloor spreading rifts of Late Cretaceous to Early Cenozoic and Mid to Late Cenozoic age, behind the present subduction fronts. Forming a near-stepped 'Strip of Fire', the belts extend 12000 km N-S in length and up to 1500 km in width from the adjacent spreading rifts. Although this activity dates back to rift-spreading inceptions, it still continues or remains dormant in places 15 to 50 Ma after spreading ceased. This zone reflects a long history of tectonic-influenced magmatism, still incompletely resolved in its overall genesis.

The East Australian sections fringing the older Coral Sea and Tasman Sea spreading rifts show prolonged basaltic activity for 100 Ma. Various tectonic models, including plate collision and mantle flow, are invoked to account for mixed patterns of older and younger basalt fields and plume-like migratory felsic centres and sea-mounts. The East Asia-Russia and West Antarctica sections, which fringe younger Cenozoic spreading rifts represent post-35 Ma basaltic activity, but include some large volcanoes with felsic activity.

Basaltic fields within the 'Strip' show diverse geochemistry, partly related to extents of magma generation/fractionation processes and partly due to the extensive range of mantle/ crustal sources tapped across such a large lithosphere-asthenosphere region The basalts incorporate EM I, EM II, DM, HIMU, Pacific-type asthenosphere, Indian Ocean-type asthenosphere and other subcontinental mantle lithospheric signatures, both geographically and temporally. Many alkali basalt fields have sourced gemstones as xenocrysts and in xenoliths from the underlying sections (sapphire, ruby, zircon, peridot, garnet, and more rarely diamond). Some relate to host magmatism, others to older lithic assemblages.

The overall genesis of the 'Strip of Fire' remains enigmatic. The adjacent seafloor rifts typify western, not eastern Pacific margins. They may mark triggers for flanking volcanism, but such prolonged activity needs added inputs. Here, spreading rifts are considered as thermal metasomatised mantle axes, which contributed to magma generation below later over-riding lithosphere. Triple-point positions would enhance effects and generate plume-like volcanoes. Progressive plate motions could continue such volcanism across plate boundaries. Examples may include metasomatised mantle along old thermal spreading rift positions for the South Tasman, Lord Howe, Norfolk and South Fiji Basins, now below volcanic regions on the West Antarctic plate and parts of the Zealandia volcanic region on the SW Pacific Plate.