

Plate Tectonics: Past and Present

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Over the last century, our portrayal of the movement and deformation of the Earth's outer layer evolved from the hypothesis of Continental Drift into Sea-Floor Spreading and then to the paradigm of Plate Tectonics. The onset of convergent plate interaction, plate tectonics, and ultimately supercontinents, are leading questions in Earth history. Early Earth was certainly very different from the planet we know today, the mantle was clearly hotter than the modern mantle, plumes of very hot magma were abundant, and the lithosphere was thinner and more buoyant. The Archean remains the most popular time-frame for the onset of plate tectonics but this question critically depends on how plate tectonics is defined. The prevalence of eclogitic diamond compositions at around 3 Ga suggest a major change in the geodynamic regime at that time and perhaps the onset of plate tectonics. Rb/Sr ratios in juvenile continental crust also increased around this time, suggesting that the newly formed crust became more silica-rich and therefore probably also thicker. A gradually cooling mantle and the onset of cold, deep and steep subduction (ultra-high pressure – UHP - metamorphic conditions) comparable with the present-day first occurred in Neoproterozoic times. Western Norway is a prime example of a large UHP terrane shaped through the Late Silurian collision of Baltica with Laurentia, and which was subsequently exhumed relatively rapidly during the Early Devonian.