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Tectonic outline of the Sunda Shelf – a satellite gravity study

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The sea surface, in this context often referred to as the marine geoid, is affected by density variations within the Earth. Geologic features of high density, e.g. seamounts or basement highs, will produce bulges in the marine geoid, whereas features of low density, e.g. trenches or sedimentary basins, will produce depressions. Thus, the sea surface will act as a gravity meter. High precision measurements of the marine geoid with satellite radar altimeters started already in the 1970's, but it was not until a few years ago it was realized that the measurements along the satellite tracks can resolve undulation as short as 5 to 10 km with a precision of 1–2 cm. This is equal to approximately 1–2 mgal when converted to gravity units. Depending upon the distance between satellite track the overall anomaly resolution of gravity maps computed from satellite altimeter data is in the order of a few tens of kilometers. The structural outline of the Sunda shelf is based on sea surface undulations computed from radar altimeter data from three satellites. Long wavelengths ~50–200 km, where processed in order to study regional undulations. The overall noise level has been estimated to about 2.5 cm, which equals 0.4 to 1.5 mgal in the regional satellite gravity field.

The regional satellite gravity field of the Sunda Shelf reveals major density variations. Gravity lows are found, as expected, over the Malay, the Ho Chi Minh and West Natuna basins. The Mekong basin, which is shown to consist of at least three subbasins, is outlined by negative gravity values, too. The most pronounced gravity low is found over the Cay Dong Basin west

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of Vietnam. The extension of this negative anomaly suggests an onshore continuation possibly related to the Mekong Basin, although the strong gravity gradient of this low does not exclude a different origin. The gravity high separating the Cay Doung and Malay basins, may be the prolongation of the Nan River Suture Zone. This density high, presumably consisting of ophiolitic mafic and ultra-mafic rocks in an arc setting with metasedimentary rocks, extends in a southeasterly direction forming the northeastern border of the Malay Basin. The Conson Density High, which separates the Mekong and the Ho Chi Minh Basins in the south, could be an extension of the Nan River Suture Zone, disrupted and offset by north-south strike-slip movements. The West Natuna Basin is separated from the Sarawak Basin by a density high identified as the Natuna Arch. The eastern border of the Sunda Shelf is demarked by the most pronounced density high in the area, possibly related to the Mesozoic Andean Arch.