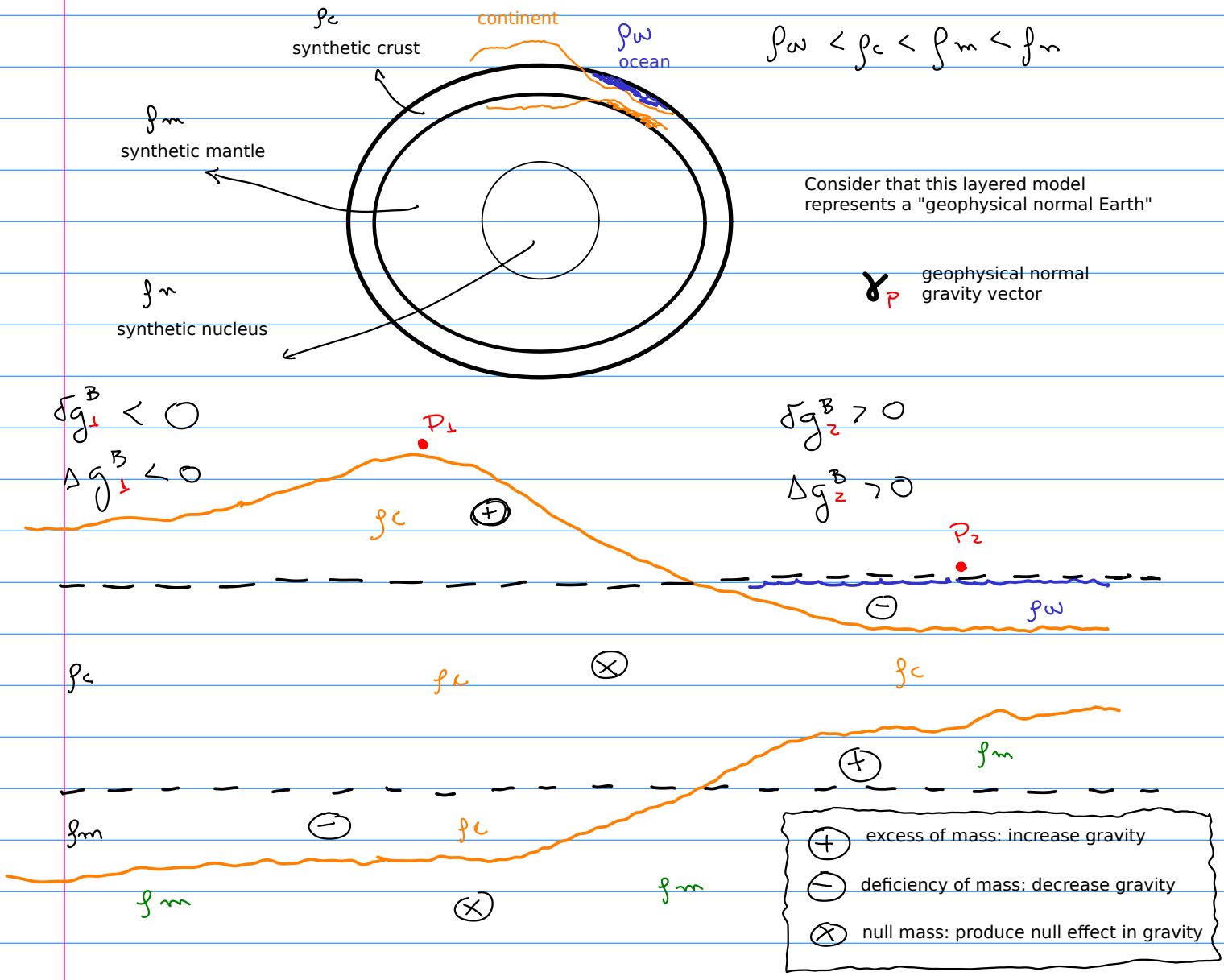
Geophysical normal Earth



The search for geologically meaningful density distributions for the interior of the normal Earth has geophysical rather than geodetic motives (Marussi et al., 1974).

In geodesy, a model for the normal gravity field can be arbitrarily defined with the sole purpose of keeping the difference from the actual gravity field as small as possible (Vaníček and Krakiwsky, 1986, p. 78)

"Although the Earth is not an exact ellipsoid, the gravity field of an ellipsoid is of fundamental proctical importance because it is ease to handle mathematically and the deviations of the actual gravity field from the ellipsoidal 'normal' field are so small that they can be considered linear. This splitting of the Earth's gravity field into a 'normal' and a remaining small 'disturbing' field considerably simplifies the problem of its determination; the problem could hardly be solved otherwise" (Hofmann-Wellenhof and Moritz, 2005, p. 65)

While ignoring the internal mass distribution of the Normal Earth is admissible for geodesy, it is not acceptable in geophysics. Since the true inner structure of the Earth is close to a layered model (as we are convinced by seismic observations), the usefulness of a Normal Earth producing a constant gravity potential on its limiting surface should be critically revaluated (Karcol, Mikuška and Marušiak, 2017, p. 65)

Marussi, A., H. Moritz, R. H. Rapp, and R. O. Vicente, 1974, Ellipsoidal density models and hydrostatic equilibrium: Interim report: Physics of the Earth and Planetary Interiors, 9, 4–6. doi: 10.1016/0031-9201(74)90073-9

Vaníček, P., and E. J. Krakiwsky, 1986, Geodesy: The concepts, second edition: Elsevier Science. ISBN: 0-444-87775-4

Roland Karcol, Ján Mikuška and Ivan Marušiak, 2017, Normal Earth Gravity Field Versus Gravity Effect of Layered Ellipsoidal Model, In: Roman Pašteka, Ján Mikuška and Bruno Meurers (eds.), Understanding the Bouguer Anomaly: A Gravimetry Puzzle, Elsevier, ISBN: 978-0-12-812913-5