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Investigations on Superswell and sea level variations caused by Superplume by using normal mode relaxation theory

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The debated hypothesis regarding the superplume and especially the one regarding Mid-Cretaceous stimulated many geologists and geophysicists to search evidences against or in favour of this hypothesis. A procedure based on normal mode relaxation theory allows to apply the superplume hypothesis to a spherical, self-gravitating and stratified viscoelastic Earth model. The results regarding the lithospheric superswell (due to the superplume) are consistent with those previously obtained by others by means of different methods, once phase-change boundary between the upper and lower mantle is considered. Moreover, we found that the deformations calculated for locations at great distances from the superswell are relatively small and even negative. However these deformations may cause some not negligible global effects, such as , for instance, eustatic sea level (ESL) variations. Previous analyses suggested that the Mid-Cretaceous ESL variations, half of which caused just by superswell, should have been about the double of the one effectively recorded. This could be an argument against the superplume hypothesis. We recalculated the ESL variations (due to the superplume) taking into account the global deformations and the (surprising) result is that the superplume contribution is negligible with respect to the typical ESL variations of Mid-Cretaceous.