

Ber. Inst. Erdwiss. K.-F.-Univ. Graz	ISSN 1608-8166	Band 21	Graz 2015
STRATI 2015		Graz, 19 – 23 July 2015	

“Eustatische Bewegungen“: The theory and definition of Eustasy by Eduard Suess, 1888

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Eduard Carl Adolph Suess (1831 – 1914) was one of the most outstanding geologists of the 19th and beginning of the 20th century. Just to remember, he introduced an entirely new theory for the origin of the Alps (1875) and similar mountain chains and the origin of ocean basins, he named the supercontinent “Gondwana-Land”, defined “Laurentia” and “Angara-Land” discovered the lost ocean “Tethys” and introduced the “Sarmatian”-Stage in the stratigraphic sequence of the Paratethys. From 1883 to 1900 he published three volumes of “*Das Antlitz der Erde*” (“The Face of the Earth”), the first comprehensive work on the geology of the world. With these volumes he became the founder of modern geology.

In the second volume of “The Face of the Earth”, published 1888, he developed and defined his theory on Eustasy his “*Eustatische Bewegungen*” and the principles what we call today Sequence Stratigraphy. The idea on Sealevel Fluctuations was born during his fieldwork in the large Neogene Basins in Austro-Hungary, especially in the northern Molasse-Basin, in the vicinity of the town of Eggenburg. Suess thought that mainly changes of the volume of sedimentary basins are causing sealevel fluctuations – named by him “*Eustatische Bewegungen*”. He recommended to use the neutral terminology of R. CHAMBERS (1848), speaking of „*shifts of relative sealevel*“ and writes „*Sobald man sich für diese neutralen Worte entschieden hat, müssen folgerichtig die Verschiebungen der Strandlinie gegen aufwärts als die positiven und jene nach abwärts als die negativen bezeichnet werden, und zwar darum, weil dies die Bezeichnungsweise aller Pegel und Mareographen der Welt ist*“. Deepening of the basins would be followed by a negative movement of the shoreline (“*eine negative eustatische Bewegung der Strandlinie*”), what we would call a regression and the filling up of the basin with sediments he would call a positive movement of the shoreline (“*eine positive eustatische Bewegung der Strandlinie*”), what we call nowadays a transgression. In that sense Suess was already seeing the causes of sealevel changes as we interpret them today by changes in the volume of oceanic basins. He also recognised, that climatic changes might be responsible for the changing sealevel, when he writes about “*beträchtliche Anhäufungen des Eises in den höheren Breiten*” and following by these thoughts the publication of PENCK, 1882 on the “*Schwankungen des Meeresspiegels*”.

In his alpine studies, writing about the Triassic and Jurassic transgression in the north of the continent, he interprets these facts as results of worldwide sealevel changes and distinguished here between different “Cycles”. He found out that there are several smaller cycles which create than a larger cycle. „*Dies sind mit anderen Worten, die kleineren Cyclen innerhalb der großen Cyclen. Noch bestimmter endlich treten die grössten Phasen oder grössten Cyclen hervor. In diesen grössten Phasen fällt es aber auf, dass jene, welche am genauesten bekannt sind, dem positiven Theile (Transgression) eine weit grössere Zeitdauer zuzumessen scheinen als dem nachfolgenden negativen Theile (Regression)*“. In this sense he postulated already 1888 the basic concepts of Sequence Stratigraphy.

In conclusion E. Suess writes 1911: “*When I wrote of eustatic movements in 1883, I confessed that I did not understand the transgressions. I thought that variations in rotation might somehow have influence. I also believed and still think that the accumulation of sediment was a vera causa, but hardly sufficient. Now, after twenty-seven years, I can not offer you more than a heap of doubts regarding the explanation. I have learnt more and know less about it.*”