

Interactive comment on “Water in the Critical Zone: Soil, Water and Life from Profile to Planet” **by M. J. Kirkby**

Anonymous Referee #1

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This manuscript is interesting as it brings together several concepts from soils, hydrology, geomorphology and food production within the modern framework of the critical zone. This is the novel idea in the manuscript and as such worthwhile publishing. The arrangement and structure of the different elements / paragraphs in the manuscript is very logical. However several of the subsections contain very general statements (section 1, 2 & 3) that are well known to the audience of Soil and I would suggest to condense these sections where possible. Several good textbooks exist on parts of the described interactions (e.g. Earth System Science by Jacobson et al. just to mention one). Sometimes also statements would need a reference or need some additional explanation. I missed in the first sections (sect 1) the human impact on soils, as mostly the natural conditions are described. This is addressed later in the paper but human impacts affect huge areas of our planet with regard to soil depth and quality. Maybe

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in the introduction also a link could be made with recent publications on the Global sustainability goals as well as the concept of planetary boundaries (Rockwell 2009; Steffen 2015) in relation to the topic of the manuscript.

Specific comments l. 43: perhaps can be omitted here l. 55: soil aggregates: also individual grains are moved l. 60 (and 172): in low relief areas vertical movement of soil water (unsaturated zone) and leached elements are also key in the development of profile characteristics and horizons, which in the end determine many properties of the soil and its ability to sustain food production or ecological functions. l. 120: this paragraph could be written down more clearly and more explanation l. 213: explain figures 3a and b better in the text l. 227: suggest reference to Ali et al. HP, 2013 l. 347: in many densely populated regions the atmospheric deposition of N is responsible for an important increase in productivity in soil in natural environments l. 443: ref needed l. 482: maybe some other effects of plants could mentioned as well: organic acids produced by plants also play an important role in soil formation and movement of leached substances through the soil as well as natural acidification and nutrient depletion, that clearly affect biomass production l. 507: leaching: a would use the word depletion here l. 522: ref. needed l. 563: actually the limit for cereal growth is 300mm of rain but this is at the current open global market far from profitable (with an production of 0.5-1 ton.ha⁻¹ at 300 mm) l. 568: I presume you mean 1200 and 60 m³ per year per capita l. 585: ref for the method applied? l. 595: reference on zai and jessour methods would be welcome l. 615 and l. 625: these two statements have been given earlier in the text l. 628: actually the cost is (or was) a bit lower, about 65 eurocent (Spain, Israel) see eg: Oñate and Peco, 2005 Figure3: explain what the color shades mean in the map: flow accumulation or infiltration rate , unit, and at what spatial scale In relation to figure 4 I would like to suggest a connection to the conceptual model of Stallard (1985) on the interaction between chemical weathering, soil depth and downslope transport in relation to topography Fig 6 and 7: can you give the data source?

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Technical comments: l. 201: mainly in (typo) l. 287: soil,. (typo) l. 505: salts .. (typo) l. 788: reference is not listed corrected

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