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Interactive comment on "A simple model of the anthropogenically forced CO_2 cycle" *by* W. Weber et al.

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Köhler et al. concede frankly the excellent performence of the simple model and its validity for simulating the anthropogenic driven past from 1850 until present. They critcise that no further theoretical understanding is implemented. However, simplicity of the underlying physics, not inclusion of all possible theories, was the goal of our paper. Obviously, our extreme simple model ansatz is quite suitable for ∼160 years.

Köhler et al. argue that the application of the simple model on future emissions is not sure. We agree. In the same meaning more complex models are not sure neither. More complex models have firstly to demonstrate the validity of their assumptions by field measurements. However, until now there are no much of such validations. We even

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did not find in the literature any complex model and its comparison with the CDIAC measurements from 1850 until present, completed by a future model projection for CO2 emission scenarios.

Köhler et al. emphasise the importance of the Revelle factor which is not considered in our model. We think Revelle is a good example to clear the point. Until present the Revell effect has not been secured by measurements (Gloor et al. 2010). We do not doubt that the ocean chemistry is well understood and the Revell factor R correctly calculated. However, we doubt that all other possible contributions of the real nature which can attenuate or even invalidate the Revelle effect are known and understood. As an example, better knowledge about the deep oceanic currents and their mixing with the oceanic surface layers is not satisfying. We believe it questionable to extrapolate pH-measurements of the Weddell Sea to a global effect of all oceans on Earth as did Hauck et al. (2010). The Revelle problem is only theoretically. Our paper was not intended to take sides for any theory about the Revelle effect.

In the common understanding of physics, a physically reasonable model of good agreement with the measurements allows to extrapolate the model. If a CO2 cycle model gives excellent results over $\sim$160 years, it can be expected that it gives also reliable answers for the nearer future. How long this agreement will last can not be decided. There is no doubt that nature is in general not linear. However, the anthropogenically forced CO2 cycle seems to be an exeption, at least over $\sim$160 years. When and how much nonlinearity will begin to change this regime is outside the scope of any reliable knowledge. Highest possible model complexity is not the guarantee for a correct answer – only field measurements. We think that the emphasis of future climate physics should be lie on measurements and less on models. The ARGO project is a good beginning of that.

If we would have not sufficiently emphasised that our results of future emission scenarios are based on an approximation of future linearity we can correct this in the final version.

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