

***Interactive comment on “The influence of
constrained fossil fuel emissions scenarios on
climate and water resource projections” by
J. D. Ward et al.***

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Dear authors,

The obvious relevance of peak oil to future anthropogenic emissions it has received little attention in the climate change debate (Kharecha and Hansen, 2008; Crúc et al., 2010). In many ways, extreme climate change projections are commonly built on the assumption that there will be essentially no issue at all with future supply of fossil energy. It is truly a pity that the current mainstream climate modellers in essence rely on emission scenarios detached from the physical reality of fossil fuel supply and

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utilization. It is good that your paper try to change this by raising an important topic for further discussion.

Firstly, have you read the works of Jones published in 2001? (Jones, 2001. An Environmental Risk Assessment/Management Framework for Climate Change Impact Assessments. Natural Hazards, 23(2), 197-230). I think that this article should be referenced to broaden the discussion on risk assessments and highlight some important issues. It could be good to raise the issue of risk assessments and what we actually mean with risk quite early.

For comparison, I have also attached some pictures showing the expected future fossil fuel use in the A1 and A2 families from SRES. There are a few important observations that can be made from the arithmetic of growth. Every time a growing production doubles it takes more than all that has been used in all the preceding growth. Taking the average fossil energy production of A1 as an example, it is projected that the global production of fossil energy in 2040 will be approximately twice as much as in 2010. In other words, it is stated that during these 30 years the world will produce and consume more fossil energy than the total that has been consumed since the dawn of the industrialized age. This is actually quite mind-bending when stated in this way in contrast to the exponential growth rates of a few percent more commonly seen. The amount of miners, equipment, permits, investments, regional issues and social acceptance needed to achieve this huge task is not discussed in SRES in any detail as everything is just aggregated into four large world regions. There is so much to say about the emission scenarios, but I should not be going into too much details on those parts.

My area of expertise do not really allow me to comment on the actual climate modelling or the water resource projections, but I have a number of comments and suggestions on the resource/production parts of the paper.

In addition I would also like to point to one of my recent coal publications that could be a better reference to use on page 2636 (Höök et al. 2010. Global coal production

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outlooks based on a logistic model. Fuel, 89(11), 3546-3558). It makes a global coal production forecast and compiles many historical reserve and resource estimates in contrast to the one you already referred to (which only deals with USA coal).

Furthermore, I would like to highlight that the UK Energy Research Centre (Sorrell et al., 2010a, b) has conducted an independent, thorough and systematic analysis of the peak oil issue by reviewing over 500 other studies. A key conclusion is that a peak of conventional oil production before 2030 appears likely and there is a significant risk of a peak before 2020. Essentially, this concludes that there is a "consensus" among analysts that a peaking of oil production is already past or very imminent. Sorrell et al. also found that forecasts that delay the peak of conventional oil production until after 2030 rest upon several assumptions that are at best optimistic and at worst implausible. This is a very powerful reference that really can strengthen your points on peak oil. (SORRELL, S, MILLER, J., BENTLEY, R., SPEIRS, J., 2010. Oil futures: A comparison of global supply forecasts. Energy Policy, 38(9), pp. 4990–5003. SORRELL, S, SPEIRS, J., BENTLEY, R., BRANDT, A., and MILLER, R., 2010b. Global oil depletion: A review of the evidence. Energy Policy, 38(9), pp. 5290–5295.)

I also think that the weight put on Patzek and Croft on page 2639 should be toned down a little. The Multicyclic hubbert model is problematic (and likely over-pessimistic for coal) and there are a number of implicit assumptions that need to be understood when assessing the validity or plausibility of such projections. In many ways, it is just an exercise of curve fittings and with a large number of curves (or fitting parameters) excellent fits can always be made, but this has very little to do with their realism as projections. Anderson and Conder (2011. Discussion of Multicyclic Hubbert Modeling as a Method for Forecasting Future Petroleum Production. Energy and Fuels, 25(4), 1578–1584) is an excellent reference to bring up and add some more meat to the multihubbert discussions.

To summarize, I liked the paper and hope to see more similar studies in the future. Development of fossil fuel-constrained economy/climate models are likely the best option

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for a more complete approach in anthropogenic climate change/mitigation modelling.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 2627, 2011.

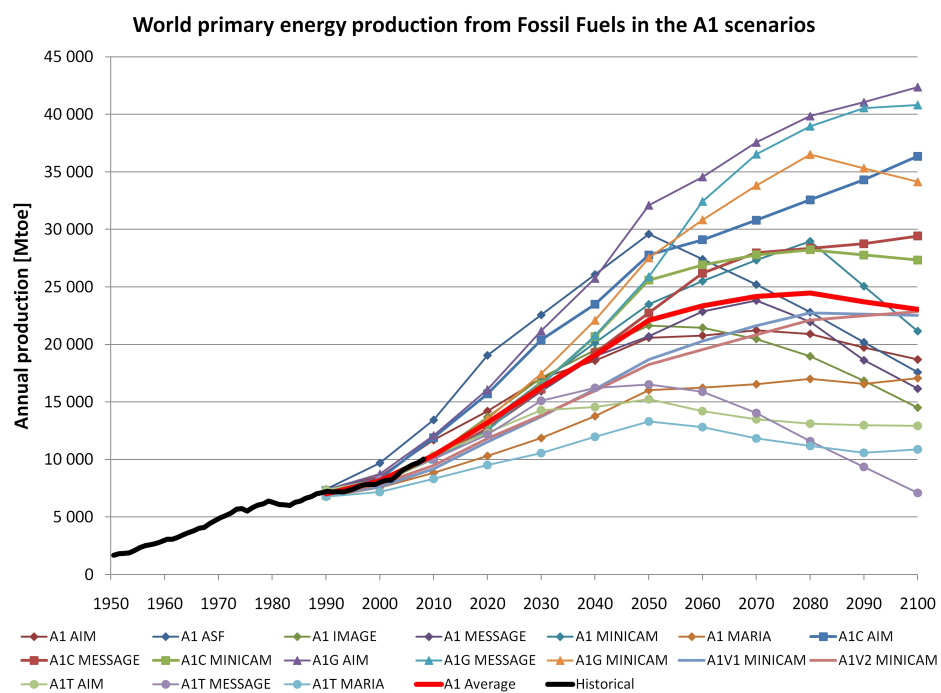


Fig. 1.

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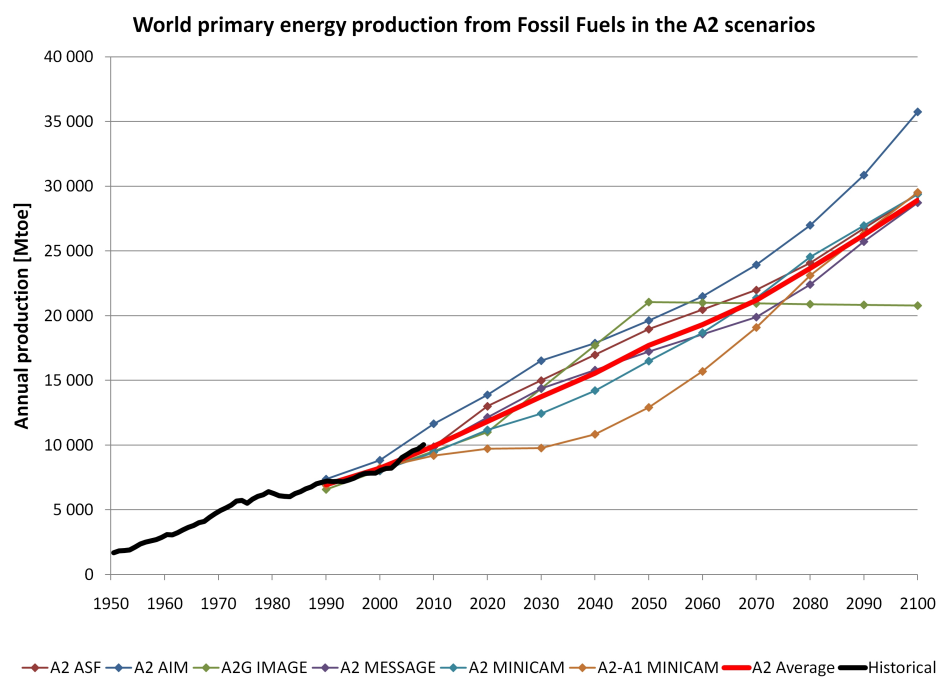


Fig. 2.

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