

## Referee report ACP Crippa et al, 40 yrs of improvements in European Air Quality

1. The paper has become much clearer now it is limited to the analysis of two alternative historic scenario's for the period 1970-2010 (STAG\_TECH and STAG\_ENERGY) and results are consistently compared to actual 2010 Reference case.
2. STAG\_TECH shows how emissions, life expectancy and crop yields in the world would have developed without the introduction of abatement technologies. The comparison with the actual 1970-2010 development shows the benefits of air pollution policy.
3. STAG\_ENERGY shows how emissions, life expectancy and crop yields would have developed without an increase in energy consumption, but with actual air pollution policy and energy policy (in the form of a less carbon intensive fuel mix and more efficient energy conversion). The comparison with the actual 1970-2010 development shows to what extent actual emission increases were caused by consumption growth. My interpretation of STAG\_ENERGY differs from the text on P7 L3-4 that highlights the other side of the same coin, namely that this scenario "demonstrates the benefit of industrial developments towards less energy-intensive and less polluting technologies"
4. The current description of STAG\_ENERGY is not completely clear. It assumes "stagnation in energy consumption since 1970 while... energy efficiency ... [is] assumed as in the reference 2010 data." (P1 L30-31; P3 L31-32). Does this mean that the 2010 primary energy use in this scenario is even lower than in 1970? I am puzzled by figure 4b-right panel, which indicates that all industrial emissions in STAG\_ENERGY are higher than in 2010\_REF. Does this mean that energy use in industry was lower in 2010 than in 1970? Data on 1970 and 2010 energy use and an equation (eq. 1b?) for this scenario would have been helpful. The text on page 6 L20-36 does not make the method very clear.
5. It is difficult to relate data in the main text to the data in the Supplementary Material. E.g. according to table S2.1 the increase in SO<sub>2</sub> for OECD-Europe in de STAG-TECH scenario compared to 2010\_REF would be 172%, P1 L35 mentions 129% for Europe. Is this because "Europe" is defined different here? Does it include Central Europe? Russia? Please use a consistent definition of "Europe" throughout the paper. The text on P9 could be made clearer if figures would be related to the same sources. E.g. now L10 refers to SO<sub>2</sub>-emissions from the power sector, while L13 refers to global SO<sub>2</sub>-emissions. L16-19 refer to power sector.