Climate Models basic FAQ's

1. Geology teaches us that the climate varies for various reasons (e.g. volcanic activity) but today the climate is varying faster than generally seen in the past.

2. There are many different models designed for different purposes. For instance, there are coarse models that model the globe but are incapable of making detailed predictions at a given location but are used to look at gross effects. There are local detailed models not capable of giving the big picture. Models exist that are based on multiple scenarios to try and understand uncertainty. What model you should use depends on the question you are trying to answer.

3. The models are calibrated using past data and then run forward to simulate the physical processes captured by the model.

4. What is modelled can vary, typically what is needed is a coupled weather – ocean – land model.

5. One of the key components of most models is the so-called grid size. Calculations are carried out at each grid node. Older climate models have used grid sizes of 100 Km, while newer models have used much smaller gird size say 25Km. The trade-off is that as grid size decreases the computing time increase dramatically. Halving the grid size of a 3d model likely increases the computational time 8 times. The detailed models need supercomputers to run them. A great example of this is the BBC weather predictions for PH34, as usual it often tells us it will rain, but very often the rain is confined to the south side of the A82 where the mountains drive the cooling of saturated air that falls as rain. The model used is such that the gird size does not differentiate between each side of the A82 and smooths out the effects of the topography.

6. Older models typically model fewer processes and as science moves on so the predictions change. For instance, currently efforts are looking at effects of cloud cover of different types and magnitude, or small scale ocean currents.

7. Government models and in our case Met Office models are typically less pessimistic than other models -why?

    a. They represent a model frozen at a point in time (see 4 and 3) in model development.
    b. There is often a political angle

    The UK's current climate model is a 2018 model – "UKCP18 is based on developments in climate science since UKCP09 to provide updated observations and climate change projections out to 2100 in the UK and globally. UKCP18 also provides sea level rise projections up to 2300 using an 'exploratory' approach."

8. Models can generally be tuned to model what has happened but are bad predictors of the future (tend to underestimate effects).

9. To make detailed predictions at a given location you need high resolution models containing the latest science.