The Asian Summer Monsoon (ASM) anticyclone is an annually recurring circulation feature of the upper troposphere and lower stratosphere (UTLS). It modulates significantly the distribution of water vapour, ozone and other trace gases on a sizable regional scale. These modulations are well observed by satellite sensors and can be used as a benchmark for chemistry-climate models. In turn, changes of the UTLS composition have the potential to feed-back on the structure of the ASM anticyclone. A systematic change of the ozone minimum that forms in the ASM anticyclone each year is a possible example. Idealised model sensitivity studies are utilised assessing possible feedbacks of systematic ozone changes and their impact on water vapour. When ozone in the ASM anticyclone is decreased, model experiments using the Met Office’s Unified Model show a significant cooling and drying of the ASM anticyclone in July. When ozone is increased only a small water vapour increase is modelled, illustrating an important asymmetry between forcing and response. A region to the southeast of the anticyclone is playing an important part for the modelled water vapour changes; here a pool of cold temperatures changes significantly. Combined temperature and water vapour diagnostics are used to characterise the area, which is distinguished by strong underlying convection. We will argue for the importance of evaluating climate models in this way to infer potential consequences for the UTLS composition under climate change.