Combining Observations and Multiple Models for an Improved Estimate of the Global Surface Ozone Distribution

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We have developed a new statistical approach for combining surface ozone observations from thousands of monitoring sites around the world with the output from multiple atmospheric chemistry models to produce a global surface ozone distribution with greater accuracy than can be provided by any individual model. The ozone observations from approximately 5,000 monitoring sites were provided by the Tropospheric Ozone Assessment Report (TOAR) surface ozone database which contains the world's largest collection of surface ozone metrics (Chang et al. 2017, Schultz et al. 2017). Output from six models were provided by the participants of the Chemistry-Climate Model Initiative (CCMI) and NASA Global Modeling and Assimilation Office (GMAO). Focus is placed on the annual maximum of the 6-month running mean of the maximum daily 8-hour average ozone value (DMA8) at each monitoring site and in each model grid cell for relevance to the long-term ozone exposure and mortality study by Turner et al (2016). This method allows us to produce a global surface ozone field that uses the TOAR observations to select the combination of global models with the greatest skill in 8 regions of the world; models with greater skill in a particular region are given higher weight, and the final model product is bias-corrected against the observations.

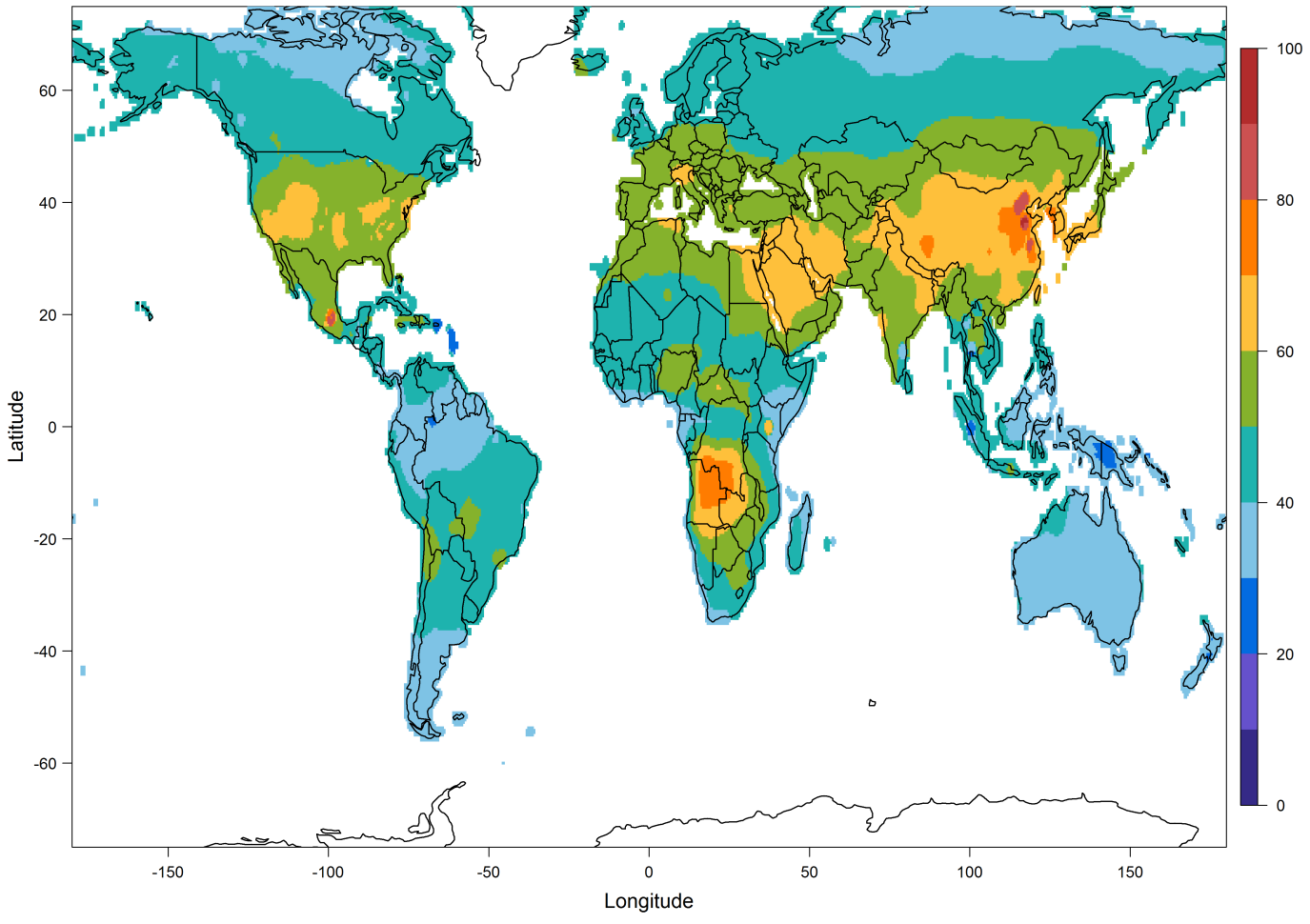

Figure 1. Fused surface ozone distribution generated from multiple models with a bias-correction by TOAR observations.