GMAO’s high-resolution model *(red line)* does a significantly better job reproducing the variability of carbon monoxide at Denver, Colorado, seen in measurements than a broadly used coarser-resolution model *(blue line)*. When running the model at coarser resolutions, the Denver grid box is large and overlaps with low-pollution areas outside the city (including parts of the Rocky Mountains). The coarser model sees the average of the low and high-pollution areas, blurring out the details and causing the model to under-predict carbon monoxide concentrations *(purple line)*.