**Module 005: Track the Southern Hemisphere ozone hole recovery**

The goals of this assignment are to compare and contrast the problems of ozone depletion and CO2-driven climate change, and explore trends and variability in the Southern Hemisphere ozone hole between 1979–2017 while strengthening skills related to the creation and interpretation of data visualizations.

* Point your web browser to <http://ozonewatch.gsfc.nasa.gov>
* Spend a few minutes exploring the site, including the various maps, graphs, and data provided.
* If needed, review some basics under the “Ozone Facts” tab.
* Click the image under the “Annual records” sidebar on the left-hand side of the page (which will take you to <http://ozonewatch.gsfc.nasa.gov/statistics/annual_data.html>).
* These data are contained in the file module\_005\_data.xlsx.
* Produce graphs of (a) time vs. ozone hole area and (b) time vs. minimum ozone.
* In a sentence or two, describe the general character of the two graphs, *i.e.*, how has the ozone hole area and minimum ozone evolved since 1979?
* What is the correlation coefficient between ozone hole area and minimum ozone?
* After 1990, which were the years of minimum and maximum ozone hole area, and what were the actual ozone hole areas in those two years (in million km2)?
* Using the table on the left-hand side of the previous page, view the ozone maps for the two years identified in the previous question. In what ways are they similar and different (in terms of the size and/or shape of the ozone hole, the actual ozone values (Dobson units), *etc.*?

Consider the following critical–thinking question.

*The Montreal Protocol is an international agreement that targets phasing out the use and production of ozone-depleting chemicals. The protocol and ozone depletion are worth considering in the context of greenhouse-gas emissions and global warming in that avoiding dangerous depletion of the ozone layer required an international effort to eliminate the use of ubiquitous industrial chemicals. In what additional ways does the problem of ozone depletion compare to the contemporary problem of global warming? In what ways might the two problems be quite different?*