Empirical Geomagnetic Inputs to the TIE-GCM

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The hierarchy of auroral/geomagnetic control parameters in the TIE-GCM is somewhat confusing, because there are so many options.

First of all, there is a switch called POTENTIAL_MODEL which can be set to either "HEELIS" (the default) or "WEIMER".

In either case, the model may then be run with namelist input parameters specifying the inputs to the potential model, or with time-dependent parameters read from a file.

For Heelis runs: the model will use the cross-tail potential CTPOTEN and hemispheric power POWER specified in the namelist inputs, if present. Alternatively, it can use KP specified in the namelist inputs, from which CTPOTEN and POWER are calculated using correlation relationships. These can also be time-dependent arrays in the namelist inputs. If CTPOTEN, POWER, and KP are **not** present, the model reads a geophysical index file, specified by GPI_NCFILE, from which it gets time-dependent 3-hour KP. A GPI file covering 1960-2015 is provided with the model download.

For Weimer runs: the model will use interplanetary magnetic field and solar wind parameters BYIMF, BZIMF, SWDEN, and SWVEL specified by the namelist inputs. If these are not present, it will read them from a file specified by IMF_FILE. A GPI file can also specified for Weimer runs, but only for solar irradiance inputs. Selected 1-year IMF files are provided with the model download, and others are available at http://download.hao.ucar.edu/pub/tgcm/.

Solar irradiance input control is similar. The model uses F107 and F107A if specified in the namelist inputs, and otherwise gets them from the GPI file. It is possible to mix solar and auroral inputs between namelist and file-based, for instance, you could run with time-dependent KP from the GPI file but constant F10.7 and F10.7 from namelist inputs.

So, if you're trying to do a "Heelis/GPI" run, or a "Weimer/IMF" run (in our vernacular), don't set namelist inputs because they will override the file-based inputs. For more details, see chapter 5 of the user guide, and the extensive comment in subroutine inp_solar in file input.F.

This note does not address more sophisticated auroral/geomagnetic specifications such as AMIE and CMIT.