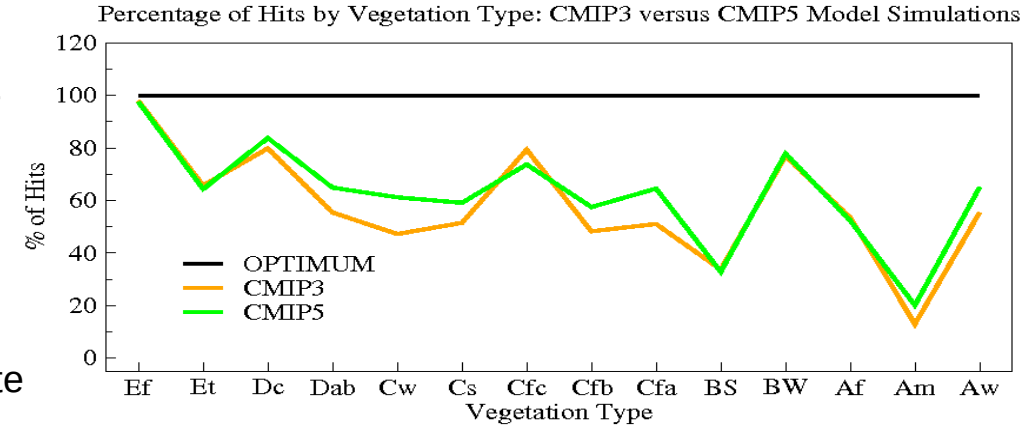
Bioclimatic Evaluation of CMIP Historical Climate Simulations

Objectives

- Use a Köppen vegetation classification scheme--based on observed characteristics of the annual cycles of continental temperature (**T**) and precipitation (**P**)--to evaluate the performance of each CMIP3 or CMIP5 model in simulating biologically important features of regional **T** & **P**.
- Develop bioclimatic metrics to objectively evaluate model performance.
- Compare collective performance of CMIP3 and CMIP5 models.



The "hits" performance metric **h**($\mathbf{v}_i$) is generally higher for CMIP5 models than for CMIP3, notably in sub-polar and middle latitudes (vegetation types D and C), but less so in tropical and subtropical regions (vegetation types A and B).

Approach/Results

- Derive 14 generic vegetation types **v** by applying Köppen criteria to both observational and modeled 1980-1999 annual-cycle climatologies of T & P.
- Define bioclimatic metrics of model performance in reproducing:

  1) observed vegetation types **v** at each grid box ("hits" metric **h**(**v**)),

  2) global areas of observed vegetation types ("area" metric **a** (**v**)).

Impact

- The collective bioclimatic performance of the CMIP5 models is superior to that of the CMIP3 models.
- This mostly results from better simulation of **T** & **P** in *sub-polar* and *middle latitudes*. Simulations remain little improved in *moist tropical and arid sub-tropical regions*.
- Thus, considerable improvement in simulating region-al **T** & **P** is still needed, as a prerequisite for realistic representation of *dynamical* vegetation in Earth Systems Models (ESMs).

Phillips, T. J., and C. J. W. Bonfils, 2015: Köppen bioclimatic evaluation of CMIP historical climate simulations. *Environmental Research Letters* doi:10.1088/1748-9326/10/064005.