

## Dynamical Downscaling

<b>Description</b>	Downscaling is a method for obtaining high-resolution climate or climate change information from relatively coarse-resolution global climate models (GCMs). Typically, GCMs have a resolution of 150-300 km by 150-300 km. Many impacts models require information at scales of 50 km or less, so some method is needed to estimate the smaller-scale information. Dynamical downscaling uses a limited-area, high-resolution model (a regional climate model, or RCM) driven by boundary conditions from a GCM to derive smaller-scale information. RCMs generally have a domain area of 10 <sup>6</sup> to 10 <sup>7</sup> km <sup>2</sup> and a resolution of 20 to 60 km.
<b>Appropriate Use</b>	Dynamical downscaling can be used whenever impacts models require small-scale data.
<b>Scope</b>	All locations.
<b>Key Output</b>	Small-scale information on future climate or climate change.
<b>Key Input</b>	Typically six-hourly, gridpoint GCM data for future climate to drive the RCM.
<b>Ease of Use</b>	Requires considerable expertise in climate modeling — for specialists only.
<b>Training Required</b>	Considerable knowledge and experience required.
<b>Training Available</b>	No specific training courses available.
<b>Computer Requirements</b>	Same computer requirements as a GCM — i.e., high-level supercomputer or massively parallel computer.
<b>Documentation</b>	Numerous publications in the scientific literature.
<b>Applications</b>	Widely applied in many regions and over a range of climate impact sectors. For a specific example, see Hay and Clark (2003) in References below.
<b>Contacts for Framework, Documentation, Technical Assistance</b>	None.
<b>Cost</b>	High. Impractical except for academic or government institutions.
<b>References</b>	Hay, L.E. and M.P. Clark. 2003. Use of statistically and dynamically downscaled atmospheric model output for hydrologic simulations in three mountainous basins in the western United States. <i>Journal of Hydrology</i> 282:56-75. Leung, L.R., L.O. Mearns, F. Giorgi, and R.L. Wilby. 2003. Workshop on regional climate research: Needs and opportunities. <i>Bull. Amer. Met. Soc.</i> 84:89-95. Giorgi, F., B. Hewitson, J. Christensen, M. Hulme, H. Von Storch, P. Whetton, R. Jones, L. Mearns, and C. Fu. 2001. Regional climate information — Evaluation and projections. In <i>Climate Change 2001. The Scientific Basis, Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change</i> , J.T. Houghton, Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, X. Dai, K. Maskell, and C.A. Johnson (eds.). Cambridge University Press, Cambridge, UK, pp. 583-638.