

Climate Emulator

Terminology Cheat Sheet

For Applied Math / Fluid Mechanics / Machine Learning

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If you are a climate scientist...	≈	If you live in an applied math / fluids world
Emulator		Surrogate model
Internal / Model / Scenario variability		Aleatoric / Epistemic Uncertainty / Parameter space search
Reanalysis		Data assimilation
Data-driven approach		Directly from input parameters to QoIs
Machine learning approach		Data-driven modeling
Projection (climatology)		Ensemble statistics
Forecast (weather) / Hindcast		Instantaneous prediction / Inverse problem
Data assimilation		(Often) Ensemble Kalman filter
Forcings		Boundary conditions
Boundary conditions		Horizontal boundary conditions
Prognostic v.s. Diagnostic variables		Variables v.s. Quantities of interest (QoI)
Climatology		A quadruple decomposition: Keep long-term + seasonal variation Drop yearly + short-term variation (weather)
Climate sensitivity		Response after doubling CO ₂
Model results		Simulations
Barotropic / Baroclinic		Vertically invariant/variant
EOF or PCA i.e. Empirical Orthogonal Functions or Principal Component Analysis		POD or ROM or PCA i.e. Proper Orthogonal Decomposition or Reduced Order Method
Parameterization		SGS modeling i.e. Sub-grid scale modeling
Convection term		Nonlinear term or advection term
Primitive equation		Governing equation
LES		URANS
Flushing time scale		Flow-through

Applied
Math

Fluid

Note: The terminology is not exactly the same, but if you want a quick understanding of the difference in the jargons...