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"Constraints and Opportunities in GCM Model Development"

Over the past 30 years climate models have evolved from relatively simple representations of a few atmospheric processes to complex multi-disciplinary system models which incorporate physics from bottom of the ocean to the mesopause and are used for seasonal to multi-million year timescales. Computer infrastructure over that period has gone from punchcard mainframes to modern parallel clusters. Constraints of working within an ever evolving research code mean that most software changes must be incremental so as not to disrupt scientific throughput. Unfortunately, programming methodologies have generally not kept pace with these challenges, and existing implementations now present a heavy and growing burden on further model development as well as limiting flexibility and reliability. Opportunely, advances in software engineering from other disciplines (e.g. the commercial software industry) as well as new generations of powerful development tools can be incorporated by the model developers to incrementally and systematically improve underlying implementations and reverse the long term trend of increasing development overhead. However, these methodologies cannot be applied blindly, but rather must be carefully tailored to the unique characteristics of scientific software development. We will discuss the need for close integration of software engineers and climate scientists to find the optimal processes for climate modeling.

- Tom