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Using Online Space Weather Modeling Resources in a Capstone Undergraduate Course

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The University of Michigan offers a senior-undergraduate-level course entitled, "Space Weather Modeling," taken by all of the space weather concentration students in the Atmospheric, Oceanic, and Space Sciences department. This is the capstone course of our undergraduate series, using the foundational knowledge from the previous courses towards an integrative large-scale numerical modeling study. A fraction of the graduate students also take this course. Because the state-of-the-art modeling capabilities are well beyond what is possible in a single term of programming, this course uses available online model resources, in particular the Community Coordinated Modeling Center (CCMC), a multi-agency facility hosted by NASA's Goddard Space Flight Center. Students learn not only how to use the codes, but also the various options of what equations to solve to model a specific region of space and the various numerical approaches for implementing the equations within a code. The course is project-based, consisting of multiple written reports and oral presentations, and the technical communication skills are an important component of the grading rubric. Students learn how to conduct a numerical modeling study by critiquing several space weather modeling journal articles, and then carry out their our studies with several of the available codes. In the end, they are familiarized with the available models to know the ranges of validity and applicability for a wide array of space weather applications.