



Hyperfast Coastal Zone Modelling of Ocean Surface Waves

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I discuss a new class of numerical methods that I have developed and apply to the modeling of ocean surface waves in the coastal zone. The types of models that I address are those within the domain of the Boussinesq equations. I use methods of algebraic geometry, topology and differential geometry that effectively transform the water wave equations of motion to a fully uncoupled set of linear steps that can be computed in parallel on multicore computers. Perfectly parallel codes of this type are also found to run rapidly on desktops: Execution time is about one hundred times faster than conventional spectral codes on a single core. The combined results are Boussinesq type codes that run over a million times faster than spectral codes on a supercomputer with 100,000 cores. I discuss a number of models and give several examples of coastal zone situations of scientific and engineering interest.