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DofColumns: a plugin for PETSc's PCGAMG

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I will present and discuss a plugin for PETSc's PCGAMG (generic algebraic multigrid) preconditioner, called DofColumns. DofColumns is intended for problems that have strong mesh-aligned anisotropy, but for which a geometric multigrid is either inappropriate or unavailable. Such problems occur in climate system modeling, where domains can span thousands of kilometers horizontally but remain $O(1)$ km thick or less. The particular motivating example in this case is ice sheet modeling, where the W:H aspect ratios for discretization are typically 25:1 or greater. DofColumns works by dividing the aggregation phase of restriction construction into horizontal and vertical sub-phases. DofColumns is also intended to be a simple example of the extensibility of the PCGAMG framework for algebraic multigrid, and its use to generate AMG variants tailored to individual problems.