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The Collaborative Seismic Earth Model: Generation 2

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We present the second generation of the Collaborative Seismic Earth Model (CSEM), a multi-scale global tomographic Earth model that continuously evolves via successive regional and global-scale refinements. Given finite computational resources, a systematic community effort enables the Earth model construction within the CSEM-architecture. It thereby takes advantage of the distributed human and computing power within the seismological community. The basic update methodology utilizes the current version of the CSEM as the initial model for regional tomographies. This setup allows to consistently incorporate previously accumulated knowledge into each new iteration of the CSEM. The latest generation of the CSEM includes 21 regional refinements from full seismic waveform inversion, ranging from several tens of kilometers to the entire globe. Some noticeable changes since the first generation include detailed local waveform inversions for the Central Andes, Iran, South-east Asia and the Western United States, continental-scale refinements for Africa and Asia and a global long-period tomography in areas that are not included in any of the submodels. Across all regional refinements in the current CSEM, three-component waveform data from 1,637 events and over 700,000 unique source-receiver pairs are utilized to resolve subsurface structure. Minimum periods of models range between 8 and 55 seconds. Using this model as a starting point, a global full-waveform inversion over multiple period bands down to periods of 50 seconds is deployed to ensure that the regional updates predict waveforms and that whole-Earth structure is honored. In this contribution, we will present the CSEM updating scheme and its parameterization, as well as the current state of the model. We show that the model predicts seismic waveforms on global and regional scales. Active participation in the project is encouraged.