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Eugene R. Wahl* (eugene.r.wahl@noaa.gov), 325 Broadway Street, Code E/CC23, Boulder, CO 80305. *Advances and Opportunities for Mathematical Treatment of Paleoclimate Reconstructions.*

Important advances in the field of paleoclimate reconstruction have recently come from the interaction of climatologists and mathematicians. For example, consideration of random processes naturally involved in using properties of one earth subsystem ("proxies") to deduce properties of another (climate) motivates the re-evaluation of reconstruction methods in terms of joint or conditional probability distributions. In this regard, application of Bayesian Hierarchical Modeling (BHM) allows for: 1) explicit characterization of data and climate processes in the reconstruction model; 2) better representation of spatial characteristics in reconstruction design; and 3) systematic representation of uncertainties, leading to probabilistic ensemble outcomes. Traditional "transfer functions" often can be described in terms of BHMs, allowing for formal comparison and treatment of methods in new ways. In parallel, there is significant re-exploration of calibration/validation theory and bootstrapping, targeting a deeper understanding of the potential and limits of traditional methods and their extension into true ensembles. Examples of these and other advances will be presented, with the goal of stimulating further collaboration between scientists and mathematicians in paleoclimatology. (Received September 20, 2012)