Reply to “Comments on ‘Reanalyses and Observations: What’s the Difference?’”

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I would like to thank Hoffman et al. (2017) for their comments. They find that some important points were omitted from my essay: 1) that different types of geophysical data often are not interchangeable, because they represent physical quantities at different scales; 2) that how uncertainties are most usefully characterized can depend on the purpose for which the data will be used; and 3) that (re)analyses often have significant limitations, related in part to their reliance on imperfect statistical and model information. I agree that these are important points, well worth emphasizing. Nevertheless, there are some other matters on which we disagree.

Hoffman et al. object to classifying (re)analysis results as measurements or observations. I do not wish to argue about labels. As a philosopher of science, however, I am interested in understanding and characterizing scientific practices, and I find that there is a coherent and plausible way of thinking about measurement that in principle allows that both rain gauge data and (re)analysis results can be measurement outcomes. On this view, measuring is an information-gathering process that involves physical interactions with the world—which put instruments into particular states—as well as inferences from those instrument states to the values of one or more parameters1 that represent aspects of the world; the inferences, which sometimes involve theoretical or empirical relationships as well as statistical processing, are guided by a conceptualization of how the physical interactions can provide information about the parameters of interest, that is, by a measurement model (see Parker 2016, 2017, and references therein for details).

It is perfectly consistent with this view that there are different types of measurement. Elsewhere, for instance, I have distinguished three types, which differ in the layers of inference involved in going from instrument states to measurement outcomes (Parker 2017); many other typologies are also possible. This way of thinking about measurement thus allows us to capture what is common to many data production activities while still leaving room to recognize important differences. It also has the advantage of making very salient the fact that the reliability of data—even data produced with the help of relatively simple instruments—depends in part on the reliability of the inferential steps employed in their production, and not just on the reliability of the physical “imprinting” mechanisms emphasized by Hoffman et al.’s analogy with fossils.

Hoffman et al. contend that (re)analyses are “further removed” from reality than traditional observations, and they highlight cases in which (re)analyses were found to have misrepresented phenomena; they conclude that users should “be wary of equating analyses with observations.” The implicit view seems to be that traditional observations are generally more reliable than (re)analyses. A primary aim of my essay, however, is to discourage appeals to these type-level generalizations about reliability, advocating instead that we consider the strengths and limitations of the particular data at hand, whatever their type. After all, it would be easy to provide a list of cases in which traditional observational data misrepresented phenomena in significant ways too. We should avoid treating data type as a proxy for data reliability.

REFERENCES


1 Here I mean “parameters” in a broad sense, encompassing both physical constants and variables.

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