

UNDERSTANDING VERSUS PREDICTION IN THE ATMOSPHERIC SCIENCES

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Von Humboldt recognized that meteorological phenomena are all interconnected – and that a disturbance in one produces a disturbance in the others. This very interconnectedness made it very difficult to fully explain these phenomena. How would one be able to separate them out for study? As a result of this difficulty, in 1845 von Humboldt maintained that the “predetermination of atmospheric changes” would be limited or “wholly precluded.” With apparent chagrin, he noted that those who maintained that prediction was the true value of meteorology were more than willing to place their confidence in “superstition” while decrying the lack of progress in physics to explain the phenomena. Less than eighty years later, Norwegian physicist-turned-meteorologist Vilhelm Bjerknes was applying graphical techniques to the hydrodynamic equations that defined atmospheric motion to predict the weather even though physical understanding remained elusive. One hundred years later, in 1945, the US Weather Bureau decided to pursue the possibility of using an electronic digital computer to forecast the weather – even though atmospheric scientists still had not developed anything approaching an adequate theory of general atmospheric circulation. This paper explores why the scientific mindset shifted from disdaining prediction as beneath the science (although the public was desperate for it) to embracing prediction as a way of developing the physical knowledge of the atmosphere that von Humboldt was seeking.

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