## Atmospheric and Ocean Science Education – reflections on the past, the present, and the future

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The atmospheric and ocean sciences are broad disciplinary areas of science, each with a long and rich history. The 18<sup>th</sup> and early 19<sup>th</sup> century founders of these disciplines were "natural philosophers" of the late Renaissance. These pioneering scientists -- Ben Franklin being a good example -- took a much more holistic view of the Earth than is common today. The disciplines that we know today - each with myriad specialty areas developed through the course of the 19<sup>th</sup> and 20<sup>th</sup> centuries. This separation of disciplines was probably to be expected, given the need for concentrated focus on aspects of the Earth and its processes to develop basic knowledge, useful tools, and information for applications. Each discipline developed its own characteristics and tradition that colored and shaped its further growth - oceanography, for example, has developed largely as research discipline (except for military applications), while meteorology has a strong emphasis on prediction of hazardous weather. However, in the closing decades of the 20<sup>th</sup> century, this situation began to change. Motivated in part by development of capabilities to observe Earth and other planets from space vehicles and in part by a growing interest in Earth's climate on both short and long time scales, it became apparent that the thee two disciplines needed to become more closely linked, both among themselves and with the solid earth and life sciences. This has given rise to new efforts such as "Earth System Science" and "biogeosciences" that are working to integrate and extend knowledge from the traditional disciplines to improve humankind's understanding of Planet Earth.

This talk will explore how the history sketched above is reflected in our educational structures and processes, and in our expectations of what students are expected to come to know, understand, and be able to do at all levels of study. I will argue that all the geosciences disciplines as a whole are in the midst of a major transition, evolving from a largely descriptive, qualitative past into a quantitative future that is as yet very unclear. Constraints on the amount of time available for students to explore the earth sciences, the explosion in knowledge about the Earth, and the rise of a broad range of companion technologies – computers of all forms, GIS, GPS, telecommunications, "smart" analytical instruments -- are significant challenges to today's teachers in trying to decide what to teach and how it should be taught. However, expectations of government, students and their parents, and prospective employers are also proving to be major challenges to those

attempting to develop programs for students. I will close by speculating a bit on what the future may hold for students, teachers, and academicians.