2000

Why the earth observing system matters to all of us

Steven W. Running
University of Montana - Missoula

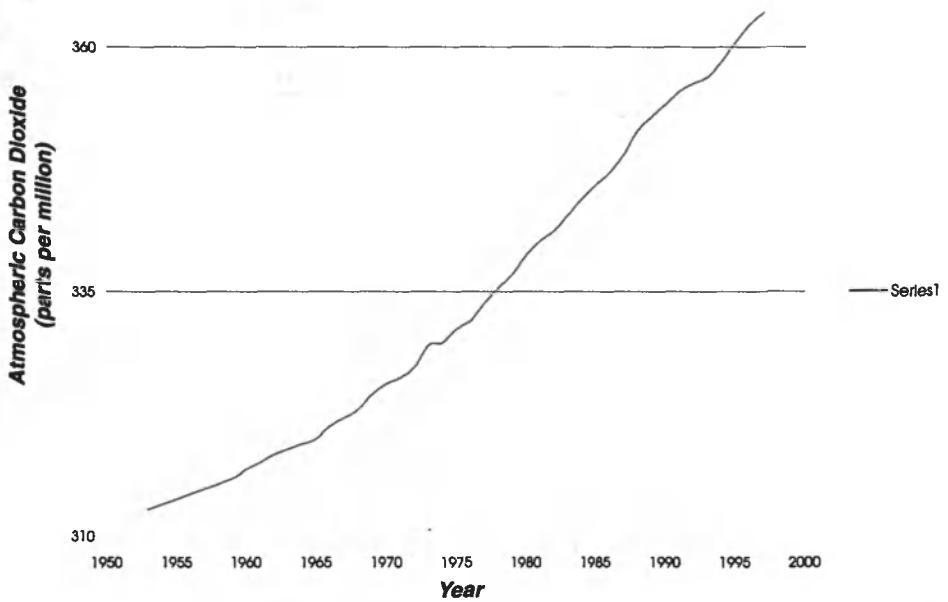
Why the Earth Observing System matters to all of us

— Steve Running (swr@ntsg.umt.edu), School of Forestry, University of Montana, Missoula, MT

Long-term monitoring of the Earth's biosphere is the goal of NASA's Earth Observing System. (Photograph Copyright Corel Corp.)

At the end of this millennium it is appropriate for us to reflect upon the world we are passing on to our children. We are the first generation in human history with the capacity to impact the entire global system. Atmospheric CO_2 concentrations have been measured carefully since 1957 at Mauna Loa, and the increase has been steady at about 0.3% per year since then, a direct result of fossil fuel combustion. Atmospheric CO_2 in itself is not dangerous—it actually helps plants grow faster. But scientists see it as a "canary in the coal mine," the leading indicator of other global-scale human impacts on the biosphere, the sum total of living organisms on the land and in the oceans. Whether the collective impacts of humans on the Earth are benign, or on a trajectory to future disaster is an ethical question we must now confront. However, studying the entire Spaceship Earth as a functioning Earth System had never been tried before, until now.

In July 1983, NASA published with little fanfare, the report of a small group of scientists aptly named *Land-Related Global Habitability Science Issues*. This brainstorming by about 20 scientists, including myself, was a first attempt to think how the entire Earth could be monitored carefully and continuously to evaluate global-change trends. NASA spent the rest of the 1980s designing a system to



The concentration of carbon dioxide in the atmosphere has increased from 310 to over 360 parts per million in the past 50 years. Carbon dioxide traps heat near the Earth's surface, and its increase may lead to global warming. (Graph by Robert Simmon, based on data from the National Oceanic and Atmospheric Administration.)

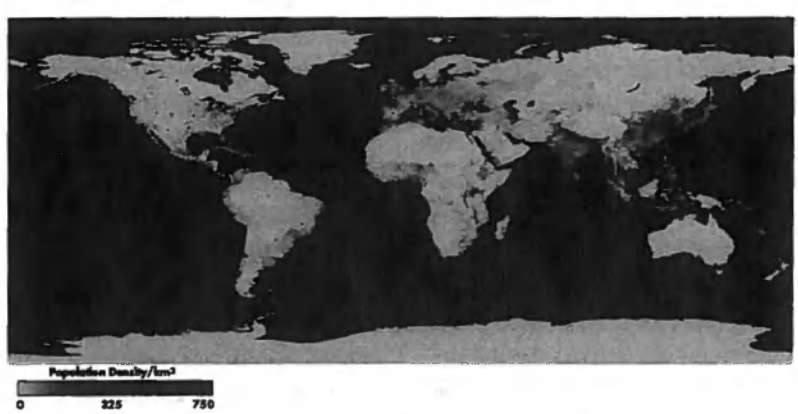


Figure 2. The areas of the world with the highest population densities—China and Southeast Asia—are rapidly industrializing. Considering the environmental record of industrialized countries, these developing nations will face important decisions between rapid growth and environmental stewardship. (Map by Robert Simmon, based on data from the Center for International Earth Science Information Network.)

measure global habitability, and the Earth Observing System (EOS) was conceived in 1990. On December 18, 1999, maybe fittingly at the end of this millennium, we launched the first satellite designed to fulfill this vision. (Note: the Terra satellite was launched December 18, 1999.) The one-line summary of the purpose of EOS is to find out: "Is the current human occupancy and activity of planet Earth sustainable?"

It is the moral imperative of our generation to pass on to our children and grandchildren a world that is equal in habitability to the world our parents gave to us. The problem is that as the global population passes 6 billion people, even if individual resource consumption stayed constant, impacts on the biosphere will increase. However, we seem to be living in bigger houses, driving fancier cars, and flying off to more vacations than our parents did, so per capita resource consumption is not staying constant at all, but increasing. And the developing world is desperately trying to catch up to the living standards of the developed countries. Many developing countries are also making the same mistakes of "development at whatever the environmental cost" that we made 30 years ago. We learned back then that rivers catching on fire and air pollution that forces schoolchildren to stay in at recess is unacceptable. The progress in cleaning up regional pollution in the United States has been remarkable in the last few decades. But now at the end of the 1990s, as we see a globalized economy, we also see a globally interconnected environment.

Documenting and monitoring biospheric health, just like human health, should not be a political topic. Biospheric health, and more specifically the sustainability of human life on planet Earth, is a topic that cuts across liberals and conservatives, Republicans and Democrats. We all want the best for our grandchildren, and to pass on to them a livable world. However, until now, global biospheric health has been largely unmeasurable, so discussions and policy development have been handicapped by a paucity of data.

Figure 3. In 1940 New York was the world's largest city, with 7.4 million inhabitants. By 1997 it had dropped to tenth, replaced by Seoul, South Korea's 10.2 million residents. The global population has grown rapidly in the past 50 years. Consequently, humanity's impact on the environment is increasing. We need to understand the environment to accurately judge the effect we have on it. (Photograph from the National Archives and Records Administration.)

The purpose of EOS is to provide this factual information on trends of change in our biosphere. How we interpret these data, and the course of action we embark on in the next millennium will be a critical political topic. If global-change trends turn out to be relatively modest, then only small adjustments in social behavior may be necessary. However, if impacts appear to be harmful and accelerating at an unpredictable pace, how can we ignore these early warnings in good conscience? It is essential that the new political discussion be based on facts, not conjecture.

These are lofty, long range, visionary objectives, similar intellectually to searching for other life in the universe. But global habitability has more immediate significance to us all. Let us hope that EOS allows us to start the new millennium with an enlightened understanding of the changing biosphere.