

Here Comes the Age of the Digital Earth and Digital Meteorology

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ABSTRACT Like the appearance of other concepts such as Information Superhighway, Star, War and Knowledge-based Economy, it is inevitable to bring about the concept of the Digital Earth following the certain level which the science and technology, and social economy have reached. It reflects the nation's trend on the major developmental needs in the fields of science, technology, politics, economy and national defence as well. We believe that the so-called Digital Earth refers to the concept that by taking advantage of the knowledge and technique drawn from sciences of the earth, information and space, people may enforce, on a comprehensive basis, the sound integration of the related but decentralized disciplines and its data so as to work out, in an objective, quantitative and dynamic way, a precise description of the information all over the world as well as China which may be used in the social and economic development. This will push the related information industries forward. As to the basic features of the concept, one of them is to regard the national strategy needs as a core, and the starting point and final purpose of the concept is to meet the demands of the nation in the fields of economic, political and social development. This will served as a standard against any relevant scientific plan and the result. Besides, the concept highlights the view of the globe, i.e. to analyses and treat the matter and to handle relations between the whole and the parts in a global view.

KEY WORDS Digital Earth Digital Meteorology

As a discipline of the earth science, atmospheric science is the science that carries out dynamic simulation and prediction on global atmosphere on the basis of actual data obtained from global and regional detection and field experiments in the way of the fixed time, place and quantity. The atmosphere is the important part of the five spheres of the earth, and the marked features of the atmospheric science, in particular the one that there is no national boundary in atmosphere fully expound that the Digital Meteorology jointly reflects the Digital Earth. With the improvement of our meteorological detection and meteorological data processing, the present conditions have basically satisfied the systematic organization and implementation of the Digital Meteorology strategy among the Digital Earth.

China has always adopted the idea of the Digital Meteorology in carrying out its science and technology, operation and application of meteorology. Over the past decade, it has made much progress in the integrated meteorological detection and has established a meteorological detection network consisting of operational radar observation network equipped with 713 and 714 serial radar, sounding stations (numbering 120) and land stations (numbering 2490). The launching of FY serial satellites proves the capability of China in the development and application of meteorological

satellites. Starting from 1999, the plan for launching the FY serial meteorological satellites has been further enhanced and normalized (Dedicated Fund for the National Meteorological Satellite has been set up), which marks that China has entered its operational meteorological satellite phase from the experimental one. The successful launch of FY-1C makes the images of visible, infrared and water vapor with 1-km resolution in anywhere around the world available. It is planned that a FY-2 stationary meteorological satellite is to be launched in 2000 and a over 20-channel FY-3 meteorological satellite in 2003 which will be equipped with an imaging spectrometer with the highest 250-meter resolution. As a result, the condition to obtain the environmental information including meteorological one will be better. To constantly meet the national needs on the preparedness and mitigation of natural disasters and to bridge the gap with the developed countries in the field of the ground-based atmospheric remote-sensing, we are organizing and implementing a New Generation Doppler Weather Radar Network Plan. It aims to deploy the advanced weather radar which are able to detect the severe weather over the important areas along the rivers and the coastal areas (The first of this kind has been installed, tested and put into operation during the flood season this year in Hefei, Anhui province.). Through the implementation of the plan, we intend to realize a nationwide weather

radar digital mosaic which will be the precise picture describing the changing weather throughout the country in a quantitative way.

Detected meteorological data have been incredibly increased due to the advancement of detection techniques, the use of modern detection tools (for instance, wind profile, Doppler radar, in particular multi-function detection satellite), the improvement of the remote-sensing retrieval technique and the improvement of the retrieval data in accuracy. The current data-archiving technique and method lag behind the increasing needs. For this purpose, Chinese meteorological service is developing the plan on distributed database and the application of mass-storing technique to meet the need.

In a sense, the science of meteorology is an experimental science. Field scientific experiments are the important means for people to know the law of atmosphere and to obtain the data on the changing atmosphere. In 1998, we organized a number of scientific experiments on atmosphere, including the South China Sea Monsoon Experiment, Qinghai-Tibetan Plateau Scientific Experiment, the Torrential Rainfall Experiment over the Both Sides of the Taiwan Straits and its Adjacent Area, and the Energy and Water Cycle Experiment along the Huaihe River Reaches and obtained quite a lot of valuable data. During the period of the tenth Five-year plan, the atmospheric community will continue to organize a number of scientific experiments to have a further study on the severe weather and the formation mechanism of the climate.

With respect to meteorological science and technique, much work has been done in the research and application of digitalization, for example, the simulation of the interaction among the spheres of the earth, monitoring of the trend of the earth environment, disaster monitoring and preparedness, and many achievements have been made in this respect. The future priority should be placed on the systematization, scale and standardization of digital application and the expansion of the new application areas.

The Digital Earth and Digital Meteorology must be carried out in an orderly, systematic and overall way. Digital Earth should be a huge plan supported by the state. It should not only include earth sciences based on the integrated data research plan, but the industry plan which set a higher standards on the technique of computer and space-based, ground-based remote-sensing. In the meantime, it also includes an application plan by which the obtained and potential data can be

directly applied into the construction of economy and the development of society. The author believes that at the present stage we should highlight the application and invert the results achieved and data resource into productive forces. Currently, the emphasis of the Digital Meteorology lies on:

1) Developing the Earth Integrated Information Dataset and Comprehensive Diagnosis System with the data detected by meteorological satellite as a core. In this system, the Earth Integrated Information Dataset shall mean the physically-sharing mass-storage database whose major body should be the space-based information data supported by the land and upper-air information data including land-based remote-sensing data, which will be considered as one of the backbone databases in the national Digital Earth plan. Comprehensive Diagnosis System means the high-speed computer processing system which is capable of dynamic simulation, prediction and animated representation of various phenomena (including meteorological related phenomena) by the efficient use of data acquired from application database.

2) Drawing up the application plan which will re-cultivate the available data resource. Considering the view that the science and technology of meteorology should render the service directly to social and economic development, the following work related to the research and development should be highlighted and implemented as soon as possible:

a) Re-establishment of the history of non-instrument measured data and treatment on the standardization of the instrument measured data so as to reproduce the historical climate spectrum;

b) Collection of the ground true of meteorological data, especially the identification, retrieval of ground true of meteorological satellite data and the application of meteorological satellite in non meteorological areas;

c) Applying such technique as four-dimension variational assimilation to assimilate the non-standardized and unharmonious meteorological data so as to acquire the actual spectrum of the dynamic changing weather;

d).Dynamic interpretation application of meteorological numerical simulation.

e).The development and use of the atmospheric information resource. For instance, we could handle with and embed the observational data on wind and water vapor in some technique method to form the applicable data to give the guidance of the development and exploitation of wind and water

vapor resource.

The implementation of such huge plans as the Digital Earth and the Digital Meteorology requires actions at national level. As a result, we recommend that the competent authorities should enforce the overall leadership on the nationwide work related to the Digital Earth, organize and implement the developmental and execution plan on the Digital Earth and Digital Meteorology. In the meantime, relevant policies, regulations and laws governing the data management and regulations on data standardization should be made to facilitate the data sharing as well as to promote the inversion of the earth-related data information resource to

productive forces. To implement the research, industry and application plan on the Digital Earth and Digital Meteorology, the involvement of departments concerned and the related basic work which the departments should do in advance are needed. Relevant demonstration activities should also be actively carried out. For this purpose, it is suggested to establish a multi-departments organizing and co-ordination body and a number of committees on special technique to jointly discuss the overall framework and major tasks for the Digital Earth and Digital Meteorology in order that the departments concerned may take possible actions.