DOI:10.16262/j.cnki.1005-0841.2002.01.011

A New Discovery in Science: Far-Reaching Effects of the Hawaiian Islands on the Pacific Ocean-Atmosphere

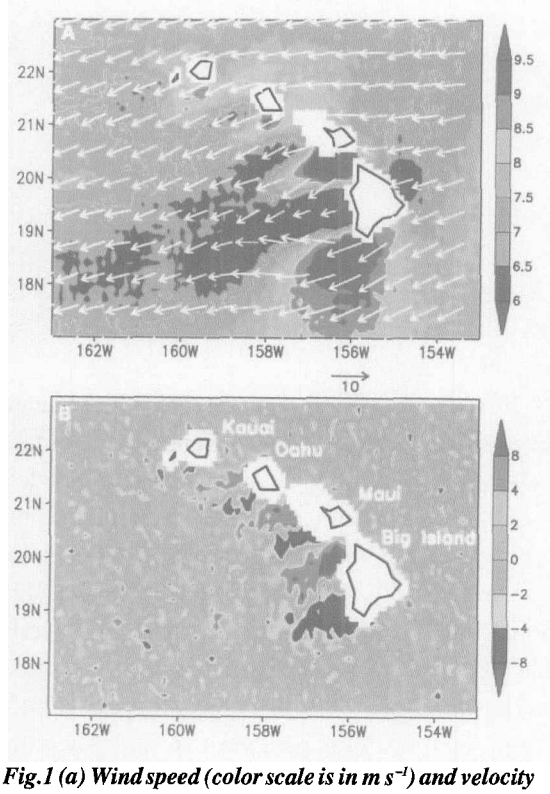

Fig.1 (a) Wind speed (color scale is in m s^{-1}) and velocity vectors, and (b) wind curl (10^{-5} s^{-1}) observed by the QuikSCAT satellite for 1 to 31 August 1999.

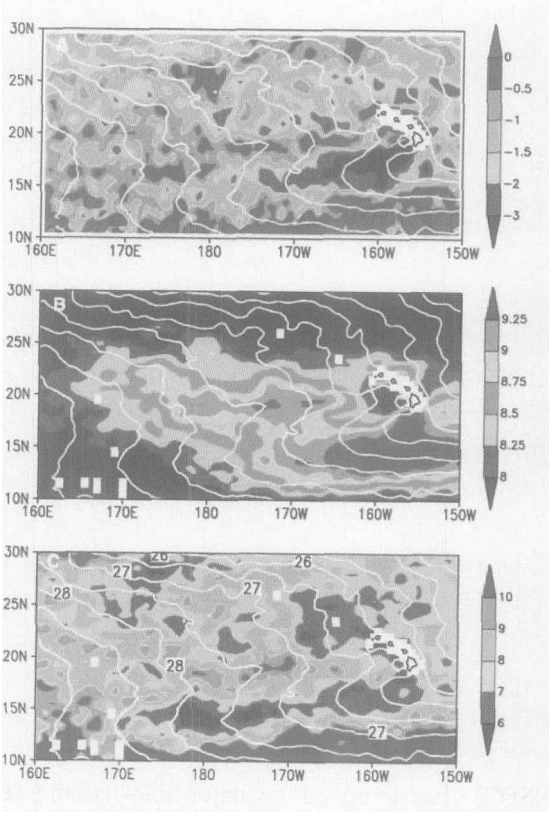

Fig.2 (a) Ekman pumping velocity (10^{-6} m s^{-1}); (b) wind speed (m s^{-1}); and (c) cloud LW (10^{-2} mm) and SST (white contours at 0.5℃ intervals), averaged for 21 July to 31 October 1999. Ekman pumping velocity (We) is defined as We=curl (γ/f)/ρ, where γ is the wind stress vector, f is the Coriolis parameter, and ρ is the water density. Because f changes only gradually with latitude, most features in (a) result from the wind curl.

Dr. Shangping Xie (IPRC, Hawaii University, USA), Dr. W. Timothy Liu (J.P.L. California Institute of Technology, USA), Professor Qinyu Liu (Ocean University of Qingdao, China) and Masami Nonaka (IPRC, Hawaii University, USA) discovered a phenomena of which there is a unusually long island "wake", i.e., a long zonal band with weaker wind and a narrow eastward ocean current extending from the west Pacific to Hawaii Islands. This research result was published in the most recent issue of *Science* (15 June 2001, Vol. 292, No. 5524, Pages 2057-2060) in title "Far-Reaching Effects of the Hawaiian Islands on the Pacific Ocean-Atmosphere". This cooperation research of America and Chinese scientists was a part of the program "Climate Features and Formation Mechanism of the Subtropical Countercurrent in the North Pacific", which is supported by the National Natural Science Foundation of China.

The researchers first discovered that there is unusually long island "wake", which is located in west of the Hawaiian Islands and caused by northeasterly trade. According to the usual theory and observation, when the broad steady northeasterly trades impinge on Hawaii, a number of mechanical wakes are formed behind the individual islands and these individual wakes dissipate

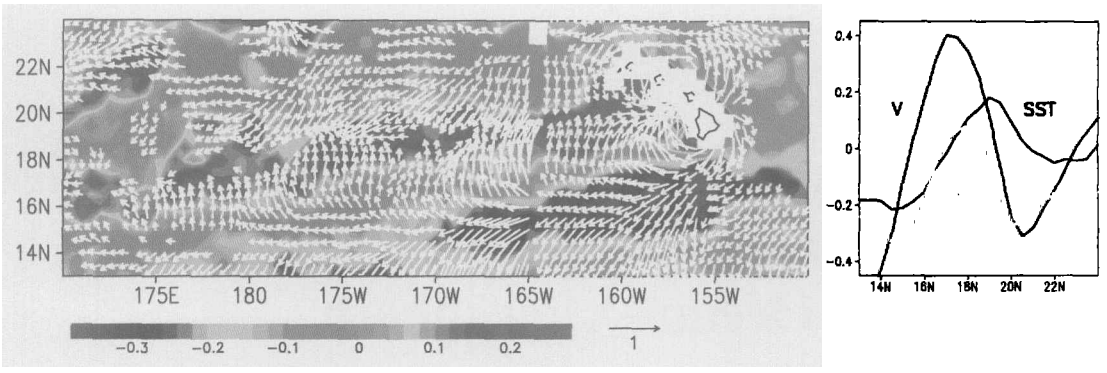

Fig.3 (Left) High-pass filtered SST (color scale is in ℃) and wind vectors (m s^{-1}), along with (right) their zonal averages for 175° W to 165° W. The vector scale is changed to 3 m s^{-1} for winds east of 165° W for clarity. The latitudinal filtering is done by subtracting an 8° moving average from the original data to remove the large-scale background fields. U and V are zonal and meridional wind velocities, respectively.

rather quickly. The author found that the high Hawaii Islands and an extraordinary positive feedback interaction between wind and ocean can cause a wind "wake" trailing westward behind the Hawaiian Islands for 3000 km, a length of many times greater than those observed elsewhere on the Earth. This wind "wake" which is a band with weaker wind, drives an eastward ocean current that draws warm water in a distance of 8000 km away from the Asian coast, leaving significant changes in surface and subsurface ocean temperature. Standing in the path of the steady trade winds, Hawaii triggers an air-sea interaction that provides the feedback to sustain the influence of these small islands on a long stretch of the vast Pacific. Researchers have poorly understood how the atmosphere responds to extratropical SST anomalies for a long time. This study suggests that subtropical ocean and atmosphere are coupled with each other much more tightly than the previous thought.

Climate researchers are struggling to determine how and to what extent the ocean and atmosphere influence on each other. The strength of this interaction is a key parameter in climate events ranging from El Niñ to ice ages and global warming. The study clearly shows how the surface winds reflect the sea surface temperature variations and the result indicates that the climate sensitivity in subtropical area is much higher than that having been thought. This new knowledge of ocean-atmosphere interplay will be helpful to improve the climate models used to predict the phenomena like El Niño and global warming.

In their report, the authors describe a chain of events to begin at the time when steady westward trade winds and the North Equatorial Current encounter the tallest Hawaiian Islands standing in the middle of the Pacific Ocean. The islands force the winds to split the creation areas of weak winds behind the islands and strong winds on the flanks of the islands. The winds associated with this broader wake spawns a narrow eastward countercurrent that draws warm water from west to east, thereby initiating a positive feedback loop between the ocean and the atmosphere. This feedback loop lets the effects of the islands continue for thousands of miles to the west.

This study shows how tiny islands, barely visible on a world map, can affect a long stretch of Earth's largest ocean. This paper is giving us new images of this ocean and is important to study the ocean circulation and climate.

(Wang Hui)

Vice President of NSFC, Prof. Zhou Bingkun (right) met with Dr. Andrew Yao (Qizhi Yao) (left), Laureate of Turing Award, on June 4, 2002, at NSFC headquarters.

Vice President of NSFC, Prof. Zhou Bingkun met with Vice Minister of S & T of Cuba, Dr. Lina Dominguez Acosta on May 16, 2002. Fifth from left, Vice Minister Lina Dominguez Acosta, fourth from right, Prof. Zhou Bingkun.

Vice President of NSFC, Prof. Zhou Bingkun met with Chinese and US experts on science policy research on December 13, 2001.

President of NSFC, Prof. Chen Jia'er, Vice President, Prof Zhu Daoben, met with Vice President of UCLA of USA, Prof. Chih-Ming Ho on November 12, 2001.

President of NSFC, Prof. Chen Jia'er met with Prof. S. N. Bagayev, Vice President of Russian Foundation for Basic Research (RFBR) and Dr. V. Kovalev, Deputy Director General of International Cooperation, RFBR, on October 23, 2001.

President of NSFC, Prof. Chen Jia'er met with Prof. David Wallace, Vice Chancellor of Loughborough University of UK on September 12,2001.

Vice President of NSFC, Prof. Wang Jie at the signing ceremony of the Protocol of Sino –US Cooperation on Earthquake Research in Washington DC on March 28, 2001. Left to right, Prof. Wang Jie; Minister Chen Zhangli of the State Bureau of Seismology; Deputy Director of USGS and Dr. Bordogna, Deputy Director of NSF.

Signing Ceremony for Program Fund Jointly by NSFC and YRCC

The signing ceremony for an agreement to finance a research program on Yellow River issue was hold on September 18, 2001 in Beijing. This ceremony was organized by NSFC (National Natural Science Foundation of China) and YRCC (Yellow River Conservancy Committee, Ministry of Water Resource, P. R. China). Mr. Guoying LI, President of YRCC, and Mr. Zhuqi LI, Vice President of NSFC, gave their speech in this ceremony. Prof. Huang Ziqiang, Vice President of YRCC, and Prof. Ma Fuchen, Vice President of NSFC, signed the agreement. Prof.Wang Jie, Vice President of NSFC, chaired the ceremony. The main purpose of the program is to adjust research subjects of Yellow River issue in order to adapt new situation in 21st century.

Both NSFC and YRCC pointed out that the research program will provide scientific and technological support for strategy, planning and management of Yellow River in 21 century, and promote basic research on water sciences, and then show contribution to solution of Yellow River issue.

Yellow River valley is a cradle of Chinese, and also a great river of many calamities in its history. In order to solute Yellow River issue, scientists and technicians have conducted a lot of research programs since founding of P. R. China, and have made great achievements that play basic role in planning and developing the Yellow River valley. On the other hand, for complicatedly natural conditions and under-developing economics in the Yellow River valley, there come serious issues including flooding, water-soil erosion, water pollution and recently water shorting in downstream. It is a hard assignment and needs long time to solute those issues. As an effort, NSFC and YRCC jointly designed the research program here in Beijing. Intention of the program is to organize top scientists in China and then conduct a research of multi-disciplinary in which both innovation of knowledge and some of its application are emphasized, and all projects of the program must combine tightly with the above-mentioned Yellow River issues.

Total value of the program is 18 million Yuan, NSFC and YRCC provide respectively 9 million-Yuan. All of value will be distributed in the next 3 years and 10 million-Yuan of which in the year of 2002. It is encouraged for scientists to make proposals of key projects with period of 4 years, and proposals of general projects with period of 3 years or major projects if necessary will accepted also. Following research areas encouraged:

(1)On the water balance and its consumption of