China and Europe to Embrace a Brighter Future for Cooperation in Earth Observation

— An Interview with Dr. Stephen Briggs, Head of Earth Observation Programme Planning and Coordination, European Space Agency

BCAS: *It is the first time that an ISRSE symposium is held in China. What's your impression about this meeting?*

Dr. Briggs: This is about the 7th or 8th of ISRSE meetings which I attended over the last 15 years or so. The Beijing meeting is very well organized and very efficient. The program is very good. There are a lot of high quality speakers. I'm impressed by the way that the program is being put together by the overall organization in Beijing which is excellent.

BCAS: *How do you see the development of Earth observation in China in recent years?*

Dr. Briggs: In terms of the infrastructure which China has put in place, there's clearly been enormous progress in the last 15 years. We see a much richer suite of satellites which is now being deployed by China. The progress is really substantial and tangible.

China is also playing an active role in the Earth observation community. It has been a part in the International Charter "Space and Major Disasters" for the last three or four years, and in April next year CNSA[1] will represent China to be the Chairman of that organization for a six month period.

BCAS: *ESA is a pioneer in terms of Earth observation satellites. In your speech yesterday you mentioned several missions ESA is to launch in the near future.*

Dr. Briggs: Yes. As I said yesterday, there are three suites of missions which ESA develops: the research missions — the Explorers, the Sentinel missions for routine operational monitoring as part of the Copernicus Program with the European Commission, and the meteorological satellites which we develop in partnership with EUMETSAT, who operates them on behalf of the European meteorological community.

For the Explorers, we've already launched three missions[2] and the fourth, Swarm, will be launched in summer this year. Swarm will provide the best-ever survey of the Earth's geomagnetic field and its variation in time, and allow new insights into the Earth's interior and climate. We also have two missions in the process of development, EarthCARE and ADM-Aeolus, and another two in the early phases of definition.

The Sentinels, perhaps the most relevant for a wider

[1] CNSA stands for China National Space Administration.
[2] According to Dr. Briggs' speech at ISRSE in Beijing on April 23, ESA's three Explorer missions already in operation are GOCE, SMOS and Cryosat, deigned to "resolve long standing questions about the Earth's gravity field, soil moisture and ocean salinity and about the physics of the cryosphere".

community, comprise a series of five missions which are being developed in conjunction with the European Commission. Sentinel-1 is a C-band radar system to continue the work of ERS and Envisat; Sentinel-2 will be a suite of visible and near infrared high resolution optical imaging systems to follow on the work of satellites such as SPOT and Landsat; Sentinel-3 will continue measurements of sea surface temperature, global vegetation and high inclination altimetry which are the heritage of Envisat. Then we have Sentinel-4 and 5, which are instrument payload packages to be flown onboard the European meteorological satellites with EUMETSAT. This will provide a very comprehensive suite of monitoring satellites for the next two decades.

As we have a partnership with EUMETSAT which develops two series of instrument payloads, one in geostationary orbit and one in polar orbit, we're also about to develop the third generation of the geostationary series and the second generation of the polar orbit series.

BCAS: *What's ESA's international cooperation strategy, especially with developing nations in Earth observation?*

Dr. Briggs: ESA strongly believes in cooperating with global partners in Earth observation and supports the Committee on Earth Observation Satellites (CEOS).

We have a number of programs which directly support the work in developing countries. The first of these was called Tiger, which looked into better management of water resources in Africa. This program supported about 40 principal investigators across the African continent; ESA supplied data and training on the use of the data, but the projects were led by African scientists.

Another program is the Global Forest Observations Initiative (GFOI) among major space agencies to support the provision of data to developing countries for developing their national forest inventories. This is a requirement under the forthcoming UN-REDD system which would allow developing countries to capitalize on their forest resources without having to destroy the trees and cut them down.

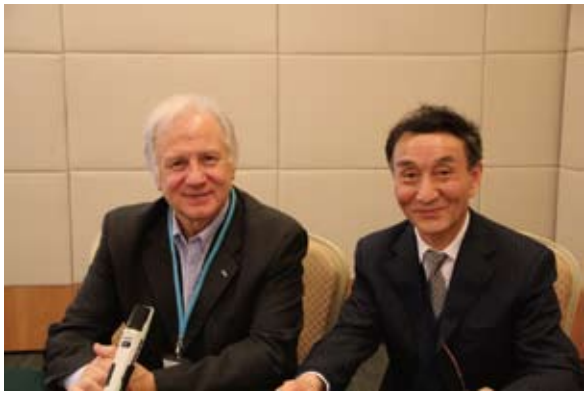
Besides, we have a number of small initiatives bilaterally with countries in South America and Southeast Asia, sometimes in partnership with organizations like World Bank for supporting such projects.

BCAS: *ESA and China started the Dragon Program in 2004.*

Dr. Briggs: Yes. The Dragon Program is now in its third phase[3]. I think the program has a very big influence on improving the scientific cooperation between Europe and China, especially on the exploitation of data. It's gone from 14 projects in the first phase to 26 in the second and now about 50 in the third. Each of these projects has a number of scientists both in China and in Europe, typically perhaps six Chinese and six Europeans. So in all there are about 500 scientists working together on the program.

I'm happy to see not only an expansion of the scientific breadth of the program, but also a greater incorporation of data which come now from Chinese satellites. In the ten years that the program has been running, China's capacity to

[3] The Dragon Program was created between ESA and the National Remote Sensing Center of China (NRSCC) in 2004 to establish joint Sino-European teams to exploit data from ESA's ERS and Envisat satellites for science and applications development. In 2012 the program entered its third phase (2012-2016).



Dr. Stephen Briggs and Dr. LI Zengyuan, chief scientist and coordinator of the Dragon Program in China from the Chinese Academy of Forestry (right), co-chairing special sessions on the Program during the ISRSE Beijing meeting in April 2013.

contribute satellite data has increased immensely. We look forward to a future phase of the program where there'll be an increasing take-up of satellite data coming from Chinese agencies as well as ESA.

BCAS: *Earth observation is of special significance to China because the nation has suffered a lot from natural disasters since ancient times. What about ESA's effort in disaster mitigation using remote sensing as a tool?*

Dr. Briggs: Disaster management and risk reduction is an increasingly important area. The biggest initiative that ESA supports in this regard is the "International Charter on Space and Major Disasters". It was created in 1999 between ESA and the French Space Agency following the UNISPACE Conference and implemented in 2000. Since then the family has grown into 15 agencies including CNSA, representing China. CNSA provides data from CBERS series of satellites[4] at the moment, but from others in the future also.

Now the Charter is available to all countries as a means of acquiring satellite data in the aftermath of major events. In the last 13 years we've had almost 400 activations of the Charter, including for the earthquake which took place several days ago in China's Sichuan Province.

BCAS: *The earthquake in Sichuan last week was the third devastating one in five years in the region. It has claimed the lives of nearly 200 people. Now many people are talking about the possibility of predicting earthquakes. Do you think remote sensing can play a role in this?*

Dr. Briggs: Well, there is some thought being given to the fact that movements in the upper mantle are associated with, or somehow cause, changes in the Earth's ionosphere. By monitoring the early changes in the ionosphere, for instance electron density, one could get some handle on the activities which are taking place in the Earth's crust and therefore possibly predict the locality of earthquakes. There are a lot of exciting experiments on that at present.

In a more concrete sense, we have a program called Supersites, operating within the framework of GEO (the Group on Earth Observations), to provide radar interferometric data from ESA, the German Space Agency and the Canadian Space Agency among others which allow us to monitor small movements in the Earth's crust. This is different from the Charter in that it's not only in response to an event, but trying to monitor the behavior of something like 50 sites worldwide which we know to be highly susceptible to earthquakes.

So we are keeping a constant watch on this to see whether we are able to look at activities which might take place before an event occurs. We are not at all certain how we can model the events, but beginning for the first time to take very detailed measurements of likely areas for earthquakes or plate tectonic activity, either earthquakes or volcanoes.

BCAS: *Looking ahead, what's the biggest challenge for Earth observation?*

Dr. Briggs: I think the biggest challenge for Earth observation is not so much a challenge for the technology but a challenge for environmental management and policy. It's clear that satellite data are a unique resource in monitoring and managing our environment. The science community has always been a strong supporter of the uses of satellite data. The challenge rests with the extent to which these data are used by the environmental management community to monitor our environment, support relevant policies or for international negotiations. The full integration, utilization and exploitation of satellite data in addressing that question will be the major challenge for us in the near future.

[4] CBERS stands for the China-Brazil Earth Resources Satellite program, a technological cooperation program between China and Brazil to develop and operate Earth observation satellites. The first satellite of the series, CBERS-1, was successfully launched in October 1999 and remained functional until August 2003. CBERS-2 was launched in 2003, replaced by CBERS-2B in 2007 and then CBERS-2C in 2011. CBERS-3 and 4 are still under development. The CBERS program has been widely regarded as a role model for South-South cooperation in science and technology.