

COP21 Special – How EO Supports UN Climate Negotiations

- We're standing here on top of a visiting tower above the town of Zurich. I actually see the very long lake that was carved in the last glaciation. Just 10,000 years ago. And it is here that the glacier ended. It tells us climate is variable. It has been much colder 10,000, 100,000 years ago, but what is more important, the change we currently observe is very fast. And you can see that from afar, it looks almost we are on a satellite. We look down and in the fog we see large features, features that have been formed by past climate change. Features that will be formed again in the future. It is important to recognise we are living in a changing environment, but the change we currently are doing to our atmosphere is man-made and we cannot reverse it. Once we are going into a rapid warming, we have to be careful because it will go out of balance, out of balance for the ice, for the vegetation, and for the environment in general. It is important to look at the big scenes from time to time, like from a satellite, to recognise change because if you're too close to an object, you don't see it changing.

- Really this is a crucial moment for the Earth, for the world, and for humanity. We're coming up now to a very exciting time with COP21. It's a unique opportunity for countries to come together and take a collective decision about the future emissions. It's come on the back of 20 years of experience of really understanding where climate is going based on satellite observations. So I think we have enough confidence now and governments have enough confidence to realise that this is something which is well understood. It's predictable, the likely outcomes are known at present and they'll come together and have to decide what they're going to do to try and change the future path of where climate is going to go. Although the two degrees temperature rise is very important, there's a political parameter. It's not the only thing which is changing on the Earth. There are other aspects, the sea level rise, changes in Arctic sea ice extent and so on, which have much more direct impact on society and we need to be able to monitor those and satellites are very good tool for doing that. We have these long term series of data which have allowed modelists to be able to make very strong predictions about the future to understand how climate behaves.

- Earth observation satellite have been major since two or three decades ago in observing the different components of the climate system like atmosphere, the oceans, the hydrosphere and cryosphere and so on. Here is the, here is two ultimate satellite developed and launched by the Europe Space Agency in 1995. It is one of the satellite we use to measure the globalof evolution. Civilised are clearly on people who are living in coastal zones. Today about 600 million people are living in coastal zones at elevation lower than 10 metres above sea level and it is expected that by 2050 about one billion people will live in coastal zones so sea level rise is really a great threat to this population. Because of this important societal and economic consequence of sea level rise, what can lead us to have better prediction for the future and to have better protection which means improving, we need to have standard observations, in particular resulting with our satellites.

- It has now been over 40 years, I have gone to the Arctic on an annual basis for expeditions. It was not until the 90s we actually realised things are changing much faster than we used to see and, therefore, it's becoming quite important to make long term measurements to see any trend, to any change. The same time, you actually have to understand the processes. Monitoring process studies and modelling are actually one and it all comes together with making measurements from space, making observations on the ground, to make implementation and use computer models to predict for the future for local phenomena and for global effects. And as a good example we have here the Greenland Ice Sheet from satellite data from 1992 basically to present. This is the graphic produced for the IPCC report on the ice masses. You can see the medium line here, this is medium of these uncertainty bands. We actually have an increase in global sea level from Greenland alone by about eight millimetres which doesn't sound a lot, but if you make the extra correlation of this curve which has been upwards and put it towards the end of the century, this becomes a major impact for the global sea level along the coast. When you look on a Greenland Ice Sheet, you actually see a beautiful white ice mass and small blue dots. Hard to see, so let's just look at them in more detail and you actually see these are lakes. The water that melts on the Ice Sheet fills up these lakes, but interesting enough, you actually don't see the river running towards the coast. If you look at one of these lakes in more detail, that shows you a lake that is just maybe 10 metres deep, filling the water from a small undulation, a few kilometres across. You can see there is some water running away. This is responding to a warmer climate. It's not short term, it is long term vision that is needed now because we run computer models to 2100. The world is not ending at 2100, it continues to get warm and if you're not effectively reducing greenhouse gas today, it will affect generations to come on a very strong impact. All the satellite data gave us a certain image and I know it looks quite complex because if you add sea level, if you add warming of the ocean, warming of the atmosphere, these are multiple informations but I think it is important that overall we know how greenhouse gases affect the Earth. We would like that the climate follows natural variability which has been for hundreds of thousands of years and does not follow the paths controlled by our greenhouse gas emissions. It is a global problem. It's not affecting just people in Greenland or people in South America, it affects everybody around the globe. If you live at sea level or if you live at the mountains, you will be affected by a change in climate.

- Satellite Earth observation is an extremely important tool that countries have to harness. Countries really have to act fast and act now and in a rapid inclusive climate informed manner. and we cannot continue business as usual. If we do so, even by 2030 we would have an additional 100 million people in extreme poverty. We're working with client countries that are extremely poor and they have hydrometeorological systems but these are often very scant, they're not operating effectively and even when they are, that don't have long term series data. So Earth observation data really complimented with the observed hydrometeorological data can provide us with a sense of how to validate the historical as well as some of the predictive capacity. But most importantly, I think the monitoring capabilities on a continuous basis from Earth observation data can help us to take development decisions

more effectively. For example, I think we've all heard about drought monitoring and how important it is to take care of famine situations and we know, for example too, that drought is going to become even more frequent and more intense. So what Earth observation technology can do with satellite data coming in is to provide us an early warning and to ensure that we can then manage this situations more proactively.

- The other aspect is to be able to understand whether the emissions constraints which governments are placing on themselves and on each other, are being adhered to in the future. In order to have a consistent approach to those observations, then satellite data can be critical for having a global worldwide systematic observation scheme for looking at the future emissions.

- It can help us to set up baselines and these baselines are critical in terms of monitoring how effective our action is going forward but it also allows countries to know what their goals and their targets are so that we work towards them. This has been applied very effectively in some situations. In Ethiopia for example, to manage the surveillance for malaria, building the capacities of the hydromet agencies to try and collect this data has been very effective in managing the onset of malaria, especially in the Highlands of Ethiopia.

- I just came back from Bhutan where I was teaching a course in climate measurements. Bhutan became interested, "How can we measure the change we observe? "The change in the mountains." They are worried. Our environment is changing as well. Even though we are far away from big cities. Today we have a global satellite network that covers the entire Earth. Multiple times a day, which gives us all the crucial information to measure and to predict and equally important, this data is available globally for all the researchers. We can help the people in Bhutan about their changes or help the people on a small island because we have the data available.

- Our observation data complimented by institute observations show unequivocally that the climate is changing. The climate is warming. All this observation clearly constitutes ground for policy makers to take wide decisions for the future and in that context, the COP21, that is the climate conference to be held in Paris, will be clearly a historical event.

- There is a hope we can limit our greenhouse gas emissions for the globe. Therefore, every nation has to be part of it. It is important that if this continues we are going to flood global villages along the coast. We are going to flood villages, towns of millions of people and this is predicted now within the next hundred years. So all the predictions that we actually have seen in the IPCC report that shows you upper limit is one metre is based on the understanding that the politicians hopefully at COP21 in Paris can limit greenhouse gas emission to a certain level and then reduce it because what we have here is a system that is not in balance. If you turn off all greenhouse emission today, leave it at the level it is, sea level will continue to rise at a certain rate, but will not go over a certain height. I think this is the important message. We have to act now to be able to have an Earth worth living in along the coastlines, along the areas we are known to live now for our generations to come.