



Tweaking for science - climate researcher Kathrin Höppner

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DLR scientist Kathrin Höppner makes an important contribution to climate research

By Dorothee Bürkle

The Schneefernerhaus, just a few metres from the top of the Zugspitze mountain. Kathrin Höppner gets up in the middle of the night to inspect her test set-up. She enjoys listening to the wind whistling around the corners of the environmental research station. But then the researcher focuses on her work again: Using her infrared spectrometer, she measures temperature at an altitude of about 87 kilometres. An important contribution to understanding climate change on Earth. This is the second part in a series of portraits on the DLR Web Portal.

For her doctoral dissertation, which she completed at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) in Oberpfaffenhofen, Kathrin Höppner in 2005 set up the GRIPS 3 spectrometer (Ground-based Infrared P-branch Spectrometer) at the Schneefernerhaus environmental research station, located at an altitude of almost 3 000 metres above sea level. Kathrin Höppner is a quiet, somewhat shy young woman, who almost always wears her hair in a ponytail. This keeps her long blond hair from getting in the way when she is fine-tuning her measuring device. Kathrin Höppner is pleased that this allows her to apply her all-round skills: "I don't like to hide behind a computer screen. This experiment involves enough hands-on contact with the hardware for me to still be aware how it actually works in practice."

As a staff member of the German Remote Sensing Data Center (Deutsches Fernerkundungsdatenzentrum; DFD), she researches an atmospheric layer known as "airglow", located at an altitude of around 87 kilometres above the Earth's surface. The temperature up there is about minus 70 degrees Celsius on average and the air density is a million times lower than it is close to the Earth's surface. Climate researchers take a special interest in this layer, as they assume that climate changes can be observed there both earlier and more intensely than on the ground. Data obtained at this altitude provide a firm basis for understanding the processes taking place in our atmosphere, and especially for drawing up climate models.

From intern to team leader

Eight years ago, Kathrin Höppner, then still a geography student in Salzburg, applied for a work placement at DLR. She almost did not apply, as she did not think that she stood a particularly good chance. Everything turned out quite differently, however: It quickly became clear that she would go on to complete both her graduation thesis and her doctoral dissertation at the Climate and Atmospheric Products Department (Abteilung Klima- und Atmosphärenprodukte) of DFD. At present, the 32-year-old researcher is working as a scientific staff member at the same department. She has just finished writing the last pages of her doctoral dissertation and is now fully participating in the institute's research activities. "I am lucky to have been given the opportunity to lead the Schneefernerhaus project right from the start of my doctoral research. I quickly found out that I really enjoy leading projects and doing project management, and that this appeals more to me than just burying myself in science and in the hunt for research results. Through my work I can get in touch with many people all over the world, that's something I really appreciate." Almost two years ago, she became team leader. She is also involved in managing the World Data Center for Remote Sensing of the Atmosphere (Weltdatenzentrum für Fernerkundung der Atmosphäre) which is hosted by her institute. The scientist does not worry about the eventuality of her current position not being extended. "Thanks to the worldwide

network I've built up over the past few years, I could also work at other institutes. That is quite an attractive prospect."

En route to Cape Town on the "Polarstern" research vessel

Her research has already taken the atmospheric researcher on a journey. In 2005, she was given the opportunity to operate her measuring instrument during a six-week voyage on the "Polarstern" research vessel in the context of her doctoral research. The measurement data that Kathrin Höppner was able to collect in this project were compared with corresponding values obtained by the SCIAMACHY measuring device, which explores the same atmospheric layer from its orbit around the Earth on Envisat (Environmental Satellite). This research formed part of a comprehensive ESA project aimed at validating the SCIAMACHY measuring instrument. "Every time the satellite passed over the 'Polarstern', we conducted measurements from on board the vessel. This allowed us to draw up a profile of the temperature in the mesosphere from Bremerhaven to Cape Town, which we could then compare with the data obtained by the satellite.

Tsunami early warning via the mesosphere

Recently, Kathrin Höppner completed an unusual project as part of her research. Together with her fellow team members, she developed an industrial prototype of a measuring device that would make it possible to improve existing tsunami early warning systems. The researchers first came up with the idea after the devastating 2004 tsunami. "We noticed that the elephants had already fled to safer areas before the tsunami hit. They were able to do so because, like some other animals, they could hear the infrasound waves generated by the tsunami; human beings do not have this ability", explains Kathrin Höppner. Since infrasound in fact simply consists of fluctuations in air pressure, and since these in turn cause very rapid fluctuations in temperature at an altitude of 87 kilometres, it occurred to Höppner's research team to observe these pressure fluctuations using GRIPS measuring devices and to participate in the Tsunami Early Warning System of the German Federal Ministry of Education and Research (Bundesministeriums für Bildung und Forschung). The atmospheric researchers may be able to significantly improve the existing early warning system: "Up to now, seismographs were used for this purpose, but they are unable to differentiate between horizontal and vertical earthquake forces. Only the latter can cause a tsunami, however, producing infrasound at the same time. We don't want to use our measurement system to give out tsunami warnings all by ourselves, but we may be able to improve the reliability of such early warning systems."

"I don't aspire to be a professor one day, but ..."

"Yes, I've become quite disciplined", Kathrin Höppner says about herself. Especially during the past few months, when she was completing her doctoral dissertation on top of the regular work on her scientific projects, she simply did not have a choice. The geographer is now considering doing her Habilitation (a German postdoctoral university degree with lecture qualification) at the university. "I don't aspire to be a professor one day, but it is a good opportunity to gain this additional experience." Scientific research, which is a precondition for the Habilitation, is something she would be doing either way, and interacting with students may well turn out to be her cup of tea. If she would really like to work as a university professor is something Kathrin Höppner does not know for certain yet. She is sure about one thing, though: "During the next few years, I would like to help advance research into the upper atmosphere, and the conditions for doing so at DLR are ideal."

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Climate researcher Kathrin Höppner



"I don't like to hide behind a computer screen", says Kathrin Höppner. In addition to her actual scientific work, the 32-year-old geographer also enjoys tweaking her test set-up.

Credit: DLR (CC-BY 3.0).

The Schneefernerhaus environmental research station on the Zugspitze mountain



Kathrin Höppner has built a measuring station located in the Schneefernerhaus environmental research station, just a few metres from the top of the Zugspitze.

Credit: DLR/Höppner.

Validating satellite data on the 'Polarstern'



Kathrin Höppner operated a measuring device on the 'Polarstern' research vessel during a six-week voyage. She used it to draw up a temperature profile of the upper atmosphere from Bremerhaven to Cape Town. The results enabled her and her colleagues to validate data obtained by the SCIAMACHY measuring instrument on Envisat (Environmental Satellite).

Credit: DLR/Höppner.

Kathrin Höppner: considering going on to postdoctoral studies



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