Markus Gross' Obituary

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Abstract

Markus Sebastian Gross passed away on 25 January 2022, due to the injuries he sustained during a household accident on 8 January 2022, and unexpected complications at the treating hospital. In this obituary we honor his character and his contributions to science and engineering.

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Vanesa Magar

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Markus Sebastian Gross was born in Bielefeld, Germany, on 20 August 1974 and passed away in Ensenada, Baja California, Mexico, on 25 January 2022, due to injuries sustained in a household accident and further complications at the treating hospital.

Markus was an engineer, a scientist, a researcher, a high-performance athlete, and an outstanding human being, well-loved by family and peers alike. He excelled at adapting to new environments despite his introverted and reserved nature and exploited his analytical and numerical skills to make the most of new opportunities. He was also a committed son, brother, husband, and father, always dedicated to his family and their well-being.

He began his higher education in his 20s in industrial design and computer-assisted engineering, first in Bielefeld and then at the Technical University of Braunschweig. From a very young age, Markus demonstrated that he could build anything he set his mind to. He was known professionally for his skills in building computers and managing clusters, in the automation of systems, and the Internet of Things. Nevertheless, he also invested a tremendous amount of time and effort into designing and building wooden furniture, house extensions and even a pool that he planned, designed, and built from scratch.

Some personal circumstances made Markus move to Edinburgh in 1998, where he continued his training in computer-assisted engineering at Heriot-Watt University, where he obtained a BSc and a PhD in Laser Materials Processing, between 1998 and 2004. During this period, he developed a finite-difference model simulating air-liquid-gas interactions at high temperatures. In 2004, he received the Henry Black prize from Heriot-Watt, for outstanding performance during his PhD and PhD thesis. He also participated in many workshops and courses on High-Performance Computing. At the ICALEO conference of 2003, he met William O'Neill, professor of Laser Engineering at the University of Cambridge, who invited him to work in his Lab, as a postdoctoral associate, on the same research that Markus had been focusing on since his undergraduate degree at Heriot-Watt. Markus accepted the offer and worked with Bill and his group at the University of Cambridge between 2004 and 2008.

Markus' passage into Meteorology initiated with Nigel Wood's offer to work with the Dynamics Research Group at the Met Office in Exeter, which he joined in September 2008. Markus said in his interview, "The Earth System is also a model with air-liquid-gas interactions", and this (amongst other things I am sure) seemed to convince the Met Office that he was a suitable candidate. His peers fondly remember him as "a gentle giant", entirely dedicated to the development of the dynamical core of the Met Office, which is still operational, and for generously helping his colleagues with diverse scientific and computational issues. He contributed to papers with several colleagues, and his code debugging skills allowed him to identify issues with the forecast codes and improve the forecast system. During the five years he served at the Met Office, he received the prize of instant recognition for his outstanding performance every year and was one of the selected candidates for the "Outstanding Scientific Achievement" price in 2012. He worked very closely with Nigel Wood, Andrew Staniforth and Andy White from Dynamics Research, as well as other researchers from other areas of the Met Office. This likely inspired him to fund the Physics-Dynamics Coupling workshops in 2014. During his time at the Met Office, he also learned how to swim and joined the Met Office cycling club. At some point, he designed the cycling club T-Shirts. Designing T-Shirts and personalized cups for team-building purposes was another of his beloved pastimes. By 2011, he considered his swimming skills to be good enough to participate for the first time in an Ironman 70.3. He participated in one Ironman 70.3 competition per year until the start of the COVID-19 pandemic, which forced him to train mostly indoors.

It was in May 2006 when Markus met his future wife, Vanesa Magar, an RCUK fellow at the University of Plymouth. By 2007 Markus had already moved partially to Plymouth. He was commuting between Plymouth and Cambridge while searching for work opportunities in the Southwest, which led to his application to the position available at the Met Office. At Plymouth, Markus started to provide computing support to Vanesa and manage their computing resources. Between 2007 and 2013, he also provided countless selfless computing support hours to some PhD students and students on summer exchanges at the University of Plymouth. Their only son, Damián Suré Gross-Magar, was born at home, in Plymouth, in April 2010.

The professional collaboration between Markus and Vanesa kept growing, and in 2012 Vanesa submitted an INTERREG proposal to work on the environmental impacts of offshore wind farms (project OFELIA), in collaboration with the University of Caen and the University of Le Havre, where Markus was an external collaborator. The proposal was approved in the summer of 2013, and the project ran for 18 months. However, Markus and Vanesa had started looking for work opportunities that would eliminate Markus' commuting between Plymouth and Exeter, reduce Vanesa's teaching responsibilities, and allow them to work more closely together. In that same summer of 2013, two opportunities materialized, one at CICESE, a Scientific Research and Higher Education Centre in Mexico with a physical oceanography department housing oceanography and meteorology researchers, and one at the University of Swansea in the UK but in different departments. After much deliberation, a decision was made to move to CICESE.

From the first day at CICESE, Markus worked hard to form and consolidate the geophysical and environmental modelling group (GEMlab) he and Vanesa founded at CICESE. They decided to focus on the Meteorology and Renewable Energy research they had started in 2008 and 2007, respectively, while in the UK. Markus designed and managed the servers of GEMlab, these computing resources slowly grew as the years went by. The GEMlab group runs and tests most of their codes in these servers before deployment in larger computing clusters.

Markus was also involved in teaching, and he developed and delivered the "Computing in Science" course from 2014 until 2021. However, the Physics-Dynamics Coupling (PDC) workshop series is one of his most relevant service legacies. The first PDC took place in CICESE in December 2014, with subsequent workshops at PNNL (2016), ECMWF (2018), at Princeton University (virtually in 2020, and hybrid in 2022). Markus also co-convened sessions at SIAM (2015) and MexSIAM meetings (2017, 2019, 2021), AGU (2020) and the annual meeting of the Mexican Geophysical Union (2018-2021) and served as research secretary for the Mexican Geophysical Union (2020-2021).

Markus' research at CICESE focused on developing numerical and statistical techniques for analyzing wind fields, improved ensemble methods for precipitation studies in Mexico's Northwest, and hydrodynamic si-

mulations for the Gulf of California. In 2015 and 2016, he published two of the first papers on offshore wind energy resources with Mexico as a case study. In 2017, a collaboration between CICESE, INEEL, DTU and ITESM in micro-mesoscale model coupling for wind energy atlases (MEWA) was established, with funding from DANIDA and with DTU as leader of the project. Markus's work within MEWA consisted of WRF simulations, data evaluation from Meteorological Stations of the Mexican Wind Atlas, and Machine Learning tools to quantify model uncertainties on wind field and wind power density estimations. This work was also supported through project no. 202001001N from the Supercomputing National Laboratory of the Southeast, based in Puebla, Mexico.

In April 2021, Markus started research on meteorological forecasting with the MPAS-Atmosphere model developed by NCAR, which he had set up in the GEMlab computers, in the Google Cloud, and on remote servers. He managed to implement the model and obtain preliminary results in a highly varying mesh resolution model, from 500 km globally to 3 km around Ensenada. He would automatically post temperature and precipitation forecasts on a GEMlab website every 24 hours. The MPAS-A work was mainly a research project, and the validity of the results was just being tested in the months prior to Markus' accident. With his untimely passing, the progress with this model was interrupted in April 2022, but GEMlab will resume this work in future. Markus had plans to continue improving the MPAS-A model predictions. The work Markus was independently carrying out the work with MPAS-A, following the lemma for GEMlab that he chose: "Curiosity-Driven Research". It is worth mentioning that by then, Markus' skills as a scientist and numerical modeller were growing very fast thanks to his efforts and dedication, he was at the prime of his career, and his international peers recognized him as one of the experts in the field.

Finally, we should mention Markus' passion for sports once more. Since he was a teenager, he would spend weekends and holidays on long-distance cycling trips that took him from Germany to Ireland and back, in the company of other fans of this sport. During his postdoctoral position at Cambridge, he would cycle one Saturday per month from Cambridge to Yeovil, where he would take the train for the last stretch to Plymouth. He also participated regularly in long-distance running competitions. When he lived in Plymouth, he would run long distances every Saturday, in a cycle of 10, 20 and 40 km. This passion for running is one of his multiple legacies to his son Damián, whom he would support in his high-performance athletics training and long-distance running since he was five.

The years of the COVID-19 pandemic were difficult, a time when we had to adapt to the home office and homeschooling. Sporting activities also suffered an impact, with Markus growing increasingly restless and depressed by the cancellation of outdoor activities. During this time, Markus designed and built a high-performance treadmill, and he started to collaborate with a biomedical research group, taking thermal camera videos of his treadmill training sessions. In the second year of the pandemic, he built a small pool in our garden, so he could carry on with his swimming training. He was planning a recirculation and solar heating system for the pool. Unfortunately, these plans did not materialize.

Markus planted numerous seeds. He will live on in our memory, through his legacy, and in the hearts of colleagues, friends, and family. Those fortunate enough to have crossed paths with him in his 47 years of life will sorely miss him, and we will always be grateful for all his love and support.

Some pictures of Markus, from 27 September 2020 while working from home during the pandemic (Figure 1), and from 21 June 2019 while on holiday in Venice Beach, California (Figure 2), are included.

Figure 1: Working from home on 27 September 2020.