Preface Magnetometry has considerable tradition in space and planetary science. Among the first launched satellites altogether in history, Sputnik 3 and Pioneer 1 and 2 ferried magnetometers into orbit in 1958, as did most scientific exploration missions following them. Most interplanetary missions have the telltale magnetometer boom; one of the more prominent recognizable features of an exploration spacecraft. Magnetometers were involved in a multitude of groundbreaking discoveries. I will highlight some of these, and discuss the part the NASA Jet Propulsion Laboratory (JPL) played here.

I will then talk about the state-of-the-art in magnetometer technology, to prepare the ground for discussing our next-generation solid state quantum center magnetometer. Flagship missions nowadays mostly carry fluxgate and vector helium magnetometers. These well-tried systems have excellent sensitivities in the range of 100 pT/$\sqrt{Hz}$, but are intrinsically complex, requiring non-miniaturizable parts and electronics (fluxgate), or cryogenics and lasers (optically pumped atomic gas).

We now propose a new approach for a self-calibrating solid-state vector magnetometer, relying on spin-carrying quantum centers in silicon carbide semiconductor devices. We show a proof-of-concept miniature magnetometer leveraging off-the-shelf and homegrown silicon carbide devices, now reaching a sensitivity on the order of 100 nT/$\sqrt{Hz}$. Compared to the heritage instruments, this number has room for improvement. I will talk about how the collaboration between JPL and QST Takasaki will facilitate that improvement, and reiterate the importance of the groundwork laid before by the collaborative studies and papers together with QST, U Gunma and U Saitama.

I will also showcase advantages of our miniaturized approach concerning new and upcoming spaceflight trends, for CubeSats, SmallSats and miniature rovers, as well as our idea of large spacecraft field cancellation with multiple micro-magnetometers.

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Hannes received his Diploma (2009) and PhD (2014, summa cum laude) in Physics at the University of Würzburg, Germany, where he studied magnetic resonance spectroscopy on organic semiconducting materials, as well as carbon nanotubes and later wide-bandgap materials such as silicon carbide. His fascination with silicon carbide quantum centers brought him to Japan in 2015, where he joined Dr. Takeshi Ohshima's group at the Japan Atomic Energy Agency (JAEA) Takasaki radiation research center, as a Marie-Curie/DAAD PRIME fellow. This appointment, which lasted until 2016, allowed him to foster a cooperation between JAEA (now QST) and the University of Würzburg concerning quantum applications of silicon carbide, yielding a considerable number of joint publications. After his return to Germany, Hannes continued working on optical spectroscopy of single photon emitters in Würzburg, still in close cooperation with QST, until he was selected for the NASA Postdoctoral Program starting August 2017. He is currently interested in spin phenomena in wide-bandgap semiconductors, specifically optically and electrically addressable quantum centers in silicon carbide.

His representative articles are addressed below:

[1] D. Stich, F. Späth, H. Kraus, A. Sperlich, V. Dyakonov, T. Hertel; *Nature Photonics* 8 (2013) 139–144
[2] H. Kraus, V. Soltamov, F. Fuchs, D. Simin, A. Sperlich, P. Baranov, G. Astakhov, V. Dyakonov; *Scientific Report* 4 (2014) 5303
[3] H. Kraus, V. Soltamov, D. Riedel, S. Väth, F. Fuchs, A. Sperlich, P. Baranov, V. Dyakonov, G. Astakhov; *Nature Physics* 10 (2014) 157–162
[4] H. Kraus, D. Simin, C. Kasper, Y. Suda, S. Kawabata, W. Kada, T. Honda, Y. Hijikata, T. Ohshima, V. Dyakonov, G. Astakhov; *Nano Letters* 17 (2017) 2865–2870
[5] T. Ohshima, T. Satoh, H. Kraus, G. Astakhov, V. Dyakonov, P. Baranov; *J. Phys. D.: Applied Physics* 51 (2018) 333002