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SQUID use for Geophysics: finding billions of dollars

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Soon after their discovery, Jim Zimmerman saw the potential of using Superconducting Quantum Interference Devices, SQUIDs, for the study of Geophysics and undertook experiments to understand the magnetic phenomena of the Earth. However his early experiments were not successful. Nevertheless up to the early 1980's, some research effort in the use of SQUIDs for geophysics continued and many ideas of how you could use SQUIDs evolved. Their use was not adopted by the mining industry at that time for a range of reasons. The discovery of high temperature superconductors started a reinvigoration in the interest to use SQUIDs for mineral exploration. Several groups around the world worked with mining companies to develop both liquid helium and nitrogen cooled systems. The realisation of the achievable sensitivity that contributed to successful mineral discoveries and delineation led to real financial returns for miners. By the mid 2000's, SQUID systems for geophysics were finally being offered for sale by several start-up companies. This talk will tell the story of SQUID use in geophysics. It will start with the early work of the SQUID pioneers including that of Jim Zimmerman and John Clarke and will also cover the development since the early 1990's up to today of a number of magnetometers and gradiometers that have been successfully commercialised and used to create significant impact in the global resources industry. The talk will also cover some of the critical technical challenges that had to be overcome to succeed. It will focus mostly on magnetically unshielded systems used in the field although some laboratory-based systems will be discussed.