

OBITUARY

Dr Anthony Myron Breed (March 31st 1970 - September 5th 2002)

Anthony Breed grew up on his parents' farm near Cummins where he developed the innovative skills and independence of mind which are necessary attributes of the first-class experimental scientist that he became.

Sadly, Anthony died unexpectedly on September 5 2002, at the very young age of 32, following a massive heart attack.

He gained a South Australian Institute of Technology medal in 1989 for outstanding achievement in his Bachelor of Applied Science degree. He chose to do research work in Applied Physics with Associate Professor Geoff Goodwin from 1989 to 1997, studying the ionized upper atmosphere (ionosphere). Initially he used radio signals from Navy Navigation Satellite System (NNSS) satellites to measure the day-to-night, seasonal and sunspot cycle variations in the electron content of the ionosphere. The measurements are important in forecasting conditions for long distance radio communication.

Subsequently, Anthony was involved in making the first long-term measurements in the southern hemisphere of the total electron content of the ionosphere by using radio signals received from Global Positioning System (GPS) satellites. The measurements allow the ionospheric error to be eliminated so that the positions of GPS receivers can be found with the highest accuracy, as required in surveying and military applications. Anthony worked jointly with personnel from the University of South Australia, the Defence Science and Technology Organisation (DSTO) and La Trobe University.

Anthony gained a Master of Applied Science (1992) and a Doctor of Philosophy (1996) for very significant contributions in satellite studies of the upper atmosphere.

Anthony then joined the Australian Antarctic Division and satisfied his sense of adventure with several visits to the Antarctic, including two winters at Casey base. With the Division he was involved in a raft of polar ionospheric studies with his scientific colleagues including: ionospheric convection; nowcasting ionospheric conditions; sporadic E; polar patches; signatures of plasma drift; E region Bragg scatter; and several specific event studies utilising ground and satellite data. This research resulted in numerous scientific publications and conference presentations. Anthony had excellent technical skills with scientific instruments, in particular with the digisonde and TIGER SuperDARN radar, and had exceptional analytical, computer and complex programming expertise - he was a well rounded experimental scientist. Anthony used these skills during the relocation of the digisonde from Casey to Davis bases in Antarctica during the 2001-02 summer - a very demanding task - and was poised to make a significant contribution to understanding polar cusp region ionospheric processes.

Anthony designed several research campaigns with the digisonde to detect polar patches and his analyses resulted in a better understanding of the ionospheric motions involved in

polar patches. Several new display techniques have shown variations in plasma drift velocity associated with patches possibly related to their formation mechanisms.

Recently Anthony analysed digisonde data for some specific events, most notably "The Day the Solar Wind Almost Disappeared," a period in May 1999 when solar wind density decreased to unusually low levels. By combining DPS data with other satellite and ground-based data, the effects of this event on the polar cap were investigated. Initial findings show a large increase in the size of the magnetosphere associated with the drop in solar wind pressure, and a corresponding shrinking of the polar cap. This resulted in the DPS observing extended periods of auroral precipitation and cusp-like signatures in drift velocity. A conference paper has been presented on this topic and a journal paper is in preparation. He extended his research interests by measuring the movement of polar patches of ionization in the upper atmosphere, using digital ionosonde radar soundings. Most recently Anthony was involved in the Tasman International Geospace Environment Radar (TIGER) project, whereby radar echoes are used to map the convective movements of the high latitude (auroral) ionosphere which is closely associated with space weather. TIGER is an important part of an international network of auroral radars.

Anthony had interests beyond his science. He was a popular and highly respected breeder of champion Alaskan Malamutes. This passion saw him spending many weekends touring around Tasmania showing his beloved dogs. He was also strongly involved in public and media promotion of these superb animals.

Anthony's self-reliance and tenacity were closely interwoven with his outstanding insight and technical ability. He is remembered as a gifted, brilliant applied physicist who has already made significant contributions to upper atmospheric research as evidenced by his several publications in recognised journals. Anthony was highly regarded by all who knew him as a kind, unassuming young man who was always unstintingly helpful to others. Sadly such a bright scientific light has been extinguished before he could further illuminate the field of ionospheric physics. He is sorely missed by his many friends and colleagues and our thoughts and sympathy are with his parents and family.

Geoff Goodwin, Ray Morris and Marc Duldig