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8 February 2008
Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78238 USA

Macelwane Medal Committee
c/o American Geophysical Union
2000 Florida Avenue, NW
Washington, DC 20009

Subject: Endorsement of Robyn M. Millan for the AGU Macelwane Medal

Dear Committee Members:

I am writing to give my enthusiastic support to the nomination of Robyn M. Millan for the AGU James B. Macelwane Medal. Robyn's early-career achievements as a researcher, teacher, and mission-level leader clearly make her an ideal candidate for the Macelwane Medal.

Robyn has achieved great prominence as a leader in balloon-based observation of relativistic electron precipitation (REP) events, in which outer radiation belt electrons precipitate into the atmosphere and emit bremsstrahlung (X-rays) that are detected by instruments on the balloons. When Robyn began her PhD research (working at U. C. Berkeley with Bob Lin, an AGU Fellow and member of the National Academy of Sciences), most balloon-borne REP measurements were limited to energies below a few hundred keV—well below the full energy range for relativistic outer belt electrons. Robyn built on this pre-existing work, extending the energy limit up to the MeV range [*Foat et al.*, 1998] and developing several successful mission payloads. Her first balloon mission, MAXIS, was launched in January 2000 and provided 18 days of flight data. Robyn used the MAXIS data to obtain estimates for the electron loss rate [*Millan et al.*, 2002] and provide much-needed observational evidence in support of the proposed role of electromagnetic ion cyclotron (EMIC) waves in the scattering loss of radiation belt electrons [*Millan et al.*, 2007; *Roth et al.*, 2002]. Robyn's next mission, MINIS, was part of a joint Dartmouth/U.C Berkeley collaboration to obtain the very first multi-point measurements of REP in magnetically conjugate hemispheres [*Kokorowski et al.*, 2006; *Clilverd et al.*, 2007]. Robyn also contributed instruments as a piggyback payload to the AESOP mission, launched in 2006 from Kiruna, Sweden. In 2007, Robyn's multi-balloon BARREL mission was selected by NASA for Phase B funding, despite competition from more conventional satellite-based missions. This is a stunning record of successful mission-level leadership for such a young scientist, and much deserving of recognition by AGU.

In the process, Robyn has established the technique of balloon-based radiation belt observation as an indispensable window on the behavior of the radiation belts. Although a handful of others have made essential contributions to balloon-based REP measurement, Robyn's leadership in this area is undeniable—she has ushered in the community-wide acceptance of this technique.

I first met Robyn in 1997 when I visited U. C. Berkeley for three weeks in support of my PhD research. At the time, I was impressed by the scope of Robyn's research—some of which was undertaken while she was an undergraduate—encompassing both space physics and astronomy [*Millan et al.*, 1998; *Wong et al.*, 1996; *Parthasarathy et al.*, 1998; *Van der Taak et al.*, 1999; *De Pater et al.*, 2003]. That wide scope has continued to be characteristic of Robyn's career; she has the enviable ability to do a lot of things at once, and to do all of them exceptionally well. In parallel with leading multiple successful balloon missions, Robyn has been teaching as a tenure-track professor at Dartmouth College, supervising and mentoring numerous students (including 3 graduate students), conscientiously serving as reviewer of numerous papers and proposals and on various panels, and publishing first-rate peer-reviewed scientific

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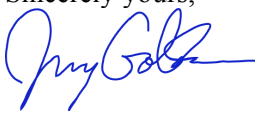
papers. In addition to her professional success, Robyn has also found time to be a certified EMT and a senior-level handler in the New England canine search and rescue (SAR) team (http://www.nek9sar.org/). She and her canine partner "Siggy" have participated in well over 60 SAR missions since 2003.

My own interaction with Robyn has centered on the close relationship between the plasmasphere and outer electron belt, a relationship which has only in the past several years begun to be fully appreciated by our field. Robyn's approach to research is multifaceted; she brings together results of models, relevant observations from both the ground and space, and necessary theoretical underpinnings to study the radiation belt problem. An investigation by Robyn and colleagues [*Lorentzen et al.*, 2000] epitomized this approach, using data from several platforms (balloons, the Polar satellite, LANL geostationary satellites) and a wave-growth model to definitively establish the role of EMIC wave scattering during storm conditions, at a time when many in the community still believed that stormtime particle dropouts were merely the result of an adiabatic (lossless) radial drift. Robyn's studies using MAXIS and MINIS data together with geostationary data, IMAGE EUV plasmasphere images, and plasmasphere models have demonstrated a clear link between outer belt precipitation and the location of plasmaspheric plumes, where EMIC wave scattering is believed to be most likely. At the 2006 Yosemite workshop, Robyn gave a terrific invited tutorial on radiation belt losses; the published article resulting from this tutorial [*Millan and Thorne*, 2007] is now quietly being circulated among space physics graduate students at various universities, as a comprehensive yet understandable paper suitable for both experts and beginners.

Robyn's accomplishments are truly impressive, indeed reflecting "significant contributions to the geophysical sciences by an outstanding young scientist." As one of the most exciting young researchers in our field today she has already demonstrated not just promise for the future, but major progress in understanding the Earth's radiation belts. She is the perfect candidate for a Macelwane Medal.

Sincerely yours,



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