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To: Macelwane Medal Committee
From: Richard M. Thorne
Re: Supporting Letter for Dr Robyn Millan for the AGU Macelwane Medal

In my opinion Robyn Millan is the leading young experimental scientist currently working in the general area of radiation belt physics. Her principal work on relativistic electron precipitation, by the use of balloon borne instrumentation, is closely related to my own research interests in the dynamical behavior of the radiation belts. Consequently, I have closely followed her career, first as a graduate student, and later since her graduation from Berkeley in 2002. After her graduation, I attempted to recruit her to join my research group at UCLA, but she chose to go to Dartmouth College and was soon thereafter (2005) rewarded with a prestigious faculty appointment, through the NSF Faculty Development in Space Sciences program. We have continued to collaborate on several projects, including a review paper on radiation belt loss, and on the new NASA Radiation Belt Storm Probe Mission of Opportunity, on which Robyn is the PI. The latter is a particularly impressive award for someone of her age, and reflects on how well respected she has already become in the field.

Robyn's research papers have had a major impact on our understanding of loss processes for energetic electrons. Despite the understandable reduction in the number of published papers during the time when Robyn was devoting considerable time to the development of instrumentation, first for the MINIS balloon payload, which was launched from Fort Churchill in 2005, and more recently for development of the BARREL mission of opportunity on the RBSP mission, her body of work has addressed the key issues on the mechanism for precipitation loss from the radiation belts. Pronounced loss occurs during the onset of most geomagnetic storms, and additional loss processes also continue into the storm recovery when the relativistic, electron flux is enhanced by various source processes in the outer radiation belt. Robyn's recent analysis of dusk side precipitation (from the MAXIS X-ray observations) has demonstrated that the loss process at the storm onset is most effective at the higher energies (>400keV), and that it can account for the simultaneous drop in trapped electron flux observed on the GOES and GPS satellites. These key observations are consistent with rapid scattering by electro-magnetic ion cyclotron waves, a process suggested earlier by Charley Kennel and myself for relativistic electrons loss during storm conditions. While further work will be needed to definitively test the proposed mechanism, Robyn's analysis has given us the best insight so far into the viability of one potentially important loss process. Understanding the rate of electron loss is critical in order

to quantify the source processes, and is a key objective of the RBSP mission. Robyn's observations of X-ray flux from high altitude balloons provides key information on the spectrum of relativistic electron precipitation, which can be used to discriminate among different loss mechanisms. Her selection as a PI for the RBSP mission of opportunity will greatly enhance the scientific return from the overall mission, since the two high altitude satellites will not have the capability of resolving the loss cone and thus will be unable to measure the precipitation flux directly.

Robyn is an extremely careful scientist, who carefully weighs the validity of the experimental evidence before making any decision on the cause. Her presentations are always well prepared and she is constantly in demand for invited talks at key meetings in the field. From my interactions with her, I conclude that Robyn would be an excellent teacher and mentor to young scientist entering the field. I can think of no one more worthy of the Macelwane medal and enthusiastically support her nomination for this prestigious award.

Sincerely

Richard M. Thorne
Distinguished Professor of Atmospheric Physics, UCLA