LETTER

Reply to Fisher: Nitrogen–albedo relationship in forests remains robust and thought-provoking

Fisher's (1) primary concerns have overlooked important methodological aspects of our study (2), whereas other concerns are consistent with our own presentation of the findings. We did not exclude photosynthetically active radiation (PAR) wavelengths, as Fisher states. Instead, we related canopy nitrogen to mean reflectance across the entire imaging spectrometer detection range of 400–2,500 nm and to independent estimates of shortwave albedo from the Moderate Resolution Imaging Spectroradiometer (MODIS), which include both PAR and near-infrared (NIR) wavelengths. Snowfall was not a factor because our analysis only included imagery from the midgrowing season to match our field sampling. Given the size of MODIS pixels, there is undoubtedly some influence of canopy gaps or nonvegetative surfaces, but their effect was minimized by focusing on large tracts of closed canopy forest.

Moreover, we did not report that nitrogen itself is driving variation in albedo but rather suggested that one or more of a suite of plant traits that covary with nitrogen apparently have a strong enough effect on canopy reflectance to influence trends in albedo. Resolving underlying mechanisms is indeed an important next step because different mechanisms will respond differently to altered N availability. Thus far, available evidence points toward leaf-level traits, which raises the possibility that N cycling can influence climate in ways that have not previously been considered. We agree that this is a hypothesis that can be confirmed or rejected through additional measurements. Regardless of the outcome, the observation of a strong nitrogen–albedo relationship in forests is novel and thought provoking, and we hope it continues to generate new ideas and discussion.

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2. Ollinger SV, *et al.* (2008) Canopy nitrogen, carbon assimilation, and albedo in temperate and boreal forests: Functional relations and potential climate feedbacks. *Proc Natl Acad Sci USA* 105:19335–19340.

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The authors declare no conflict of interest.

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