ABSTRACT
Seasonal snow and ice support important ecosystems and comprise the main water supply for nearly two billion people, yet forecasts of snowmelt runoff either do not exist or occasionally significantly under- or over-predict flows. Mapping snow cover and albedo from space has enabled a paradigm shift in our ability to observe processes that occur in the mountains. However, clouds commonly obstruct the surface in visible and infrared spectra, and existing operational cloud masks consistently misclassify some snow as clouds and some clouds as snow. This work aims to both advance our ability to utilize satellites for observing the mountain snowpack and to improve our understanding of the potential operational benefits of better forecasts from these tools. In Chapter 1, I assess errors in the cloud masks over snow-covered, mid-latitude mountains for the Landsat 8 Operational Line Imager (OLI) and for the Moderate-Resolution Imaging Spectroradiometer (MODIS) on the Terra satellite. I find a plausible reason for poorer performance of cloud masks over snow lies in the potential similarity between multispectral signatures of snow and cloud pixels. In Chapter 2, I develop a new method for snow/cloud discrimination that relies on textural and spatial features alongside the spectra to identify clouds. In Chapter 3, to understand the opportunities for remote sensing of snow for water operations, I use thirty-four years of water data in fourteen California Sierra Nevada basins to examine the association between water management decisions and spring runoff forecasts and their uncertainty. The findings indicate that increased uncertainty in a forecast is negatively associated with releases. Reduction in spring runoff forecast uncertainty is possible from remote sensing tools and would enable additional uses of releases from April through July.

BIO
While climbing, skiing, and surfing around the world Timbo Stillinger likes to think about snow. Personal experience in the mountains shapes his world view on the importance of snow and mid-latitude mountains in a global context. Before coming to the Bren School as a MESM student, he spent a year on the South Island of New Zealand climbing and skiing, funded by washing dishes and living in a van. He has also traveled around North America, India, and China to study and play in the snow. He holds a Master of Environmental Science and Management from the Bren School at UCSB and a Bachelor of Science in Molecular Environmental Biology from UC Berkeley.