



Schematic showing the process used to quantify error in estimated fractional cover under various water column properties. 1. One of ten field measured reflectance spectra for each bottom class (Live Coral, Algae, Sand) was selected. 2. The selected endmember spectra were then combined linearly in one of 48 fractional combinations to create a simulated ‘coral reef reflectance spectrum’. 3. This mixed spectrum was then passed through simulated water columns combining a variety of absorption and scattering characteristics to estimate the above-water surface reflectance. Water column properties were then estimated from the above-water reflectance of the mixed spectrum + water column using a semi-analytical optimization model. 4. Estimated water column properties were then applied to the remaining nine spectral endmembers for each benthic class. 5. These nine spectral endmembers from each class + estimated water column were then used to unmix the above-water reflectance in Step 3 using Multiple Endmember Spectral Mixture Analysis (MESMA). The fractional cover of each benthic class estimated by MESMA was then compared to the original, actual fractional cover used to produce the mixed spectrum and fractional cover estimation error was calculated.