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Optical analysis of the Pacific Ocean Neutrino Experiment(P-ONE) site using data from the first pathfinder mooring

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What is this contribution about?
This contribution covers the data analysis methods and results of the first pathfinder mission, STRings for Absorption length in Water (STRAW), for the future P-ONE km^3-scale neutrino telescope. The goal of STRAW was to measure the attenuation length and light background at the P-ONE candidate site, Cascadia Basin in the Pacific Ocean, off the coast of British Columbia, Canada.

Why is it relevant/interesting?
The optical properties of the water at the P-ONE site are critical for the success of the experiment. One of the fundamental quantities that strongly influence the design of P-ONE is the attenuation length, this property sets the scale for how far the optical modules will be set on the mooring lines as well as the distance between the lines. Knowing the background light intensity and dynamics is crucial for the design of the detector modules and the trigger system.

What have we done?
We have utilized a configuration of ns-pulsed light sources and detectors using PMTs and a fast readout system, arranged on two mooring lines and spaced by several tens of meters, in order to measure the remaining light intensity on various different baselines and using different LEDs. We have built an all-inclusive model of those measurements, including various wavelengths and intensities and use a Bayesian Markov-Chain Monte Carlo framework into which we feed all available data in order to obtain the most likely attenuation lengths and their uncertainties.

What is the result?
We found a maximum attenuation length on the order of 30 m for blue light around 450 nm, which is comparable to what has been measured at other neutrino telescope sites. The background rate varies between 10 kHz and several MHz (for a small time fraction), the former probably due to radioactive decay (mostly ^{40}K) and the latter probably from bioluminescence activity.