

Point-by-Point Response
Rain-fed streams dilute inorganic nutrients but subsidise organic matter-associated nutrients in coastal waters of the northeast Pacific Ocean

ANONYMOUS REFEREE #2

General comments:

The paper presents an excellent and pertinent study of river/coast nutrients dynamics at two islands located at the Pacific eastern coast. The objectives are clearly stated and relevant and the methods are properly described. The presented data-sets obtained along four years of monitoring, in a relatively pristine environment, constitute also a relevant contribution of the presented work.

Many thanks for this positive assessment of our study!

There are two main issues that will help to understand or further justify and explain some aspects of the obtained results, and the authors could further comment or discuss: i) the monitored marine environment “Kwakshua Channel system” hydrodynamics and nutrients exchange with the Hakai passage that receives the contribution of much greater discharges from other watersheds are not sufficiently detailed; ii) the monitoring program concentrates on surface water and low attention is put on the sediment transport (together with associated nutrients) that should be more relevant at the bottom layers. The authors should further justify their option and comment on eventual consequences for their results.

- i) The hydrodynamics of Kwakshua Channel are indeed influenced by Hakai Pass and Fitz Hugh Sound, both of which integrate exports from much larger watersheds along the coast; however, this impact is difficult to constrain as the logistics of sampling across the area as frequently as was done for the Kwakshua Channel system would be prohibitive. In acknowledgement of this influence, though, we have now stated in the site description (section 2.1): “Fitz Hugh Sound and Hakai Pass are also influenced by large freshwater fluxes from the British Columbia mainland, which likely affect nutrient dynamics within the Kwakshua Channel system; however, quantifying the influence of the mainland inputs is beyond the scope of the present study.”
- ii) Surface waters (0-5 m) were the focus of the sampling program because these waters are the area of both highest freshwater influence and highest primary production. This is a valid point about the connection between surface and bottom waters with respect to nutrient dynamics along the coast. We unfortunately only have a very small number of deeper water samples that do not match the spatial or temporal resolution of the surface samples, therefore limiting the conclusions about the connection between surface and bottom waters that can be drawn. Particulate organic carbon exports were previously reported for these watersheds (St. Pierre and Oliver et al., 2020) and are one to two orders of magnitude lower than for the dissolved organic carbon, suggesting that sediment export from these watersheds are of relatively little importance compared to the dissolved fluxes. The potential remobilisation of Fe from the sediments was discussed in the initial submission, but we have added a new paragraph to this discussion in section 4.2 to further elaborate on the connection between bottom waters and surface processes.

Specific comments:

Line 62: “receives upwards of 2000 mm of rainfall per year”. Is this an average maximum value? Please specify.

2000 mm per year is the median annual precipitation for the North Pacific coastal temperate rainforest region as described in Della Salla, 2011. Site-specific precipitation across the region can range between 1000 mm and more than 4000 mm, depending on location, elevation and year.

The sentence has been edited to read: “... receives on average 2000 mm of rainfall per year, with some locations receiving upwards of 4000 mm (Della Sala, 2011).”

Line 406 - Please, explicitly indicate the watersheds area instead of mention “smaller”

In the following line, we now specify the range of the study watershed areas (3.2–12.8 km²) as this is the range of watersheds over which we are comfortable that the decoupling from wider scale climate anomalies takes place.

Technical corrections:

Line 76: “(Giesbrecht et al. 2016 and in review “ delete “and”
“and” has been exchanged for a comma.

Line 110: “(Gonzalez Arriola et al., 2015” – change to Arriola et al. 2015

Gonzalez is part of the researcher’s surname and has not been removed from the citation.

Lines 159-160: The sentence is not clear. Please rephrase.

The subject of the second clause of the sentence seems to have been lost! The sentence now reads: “However, rainfall is a notoriously difficult climate parameter to measure accurately, let alone model and model estimates should improve over time with the incorporation of additional data sources.”

Lines 253-254: Check or format the full range for temperature (use “to” instead of “-“)

Biogeosciences requests that the en dash “–” be used for specifying ranges. Per this guideline, we have exchanged the hyphen “-” for “–“ throughout the manuscript.