

Attn: Professor Heather Viles  
Associate Editor  
Earth Surface Dynamics  
23 May 2020

Dear Professor Viles,

Thank you for managing our manuscript “Mātauranga Māori in Geomorphology: existing frameworks, case studies and recommendations for Earth scientists” (manuscript number esurf-2020-5). We are grateful for the valuable reviews that we received from Carolina Londono and an anonymous referee. We hope the changes to our manuscript will be satisfactory for publication in Earth Surface Dynamics.

We thank the two referees for their constructive and insightful reviews. Based on their comments, as well as the short comment we received from Dr. Marc Tadaki, we felt the most important actions to take were to:

1. Increase readability of the text in terms of Māori language terms and English translations;
2. Strengthen the explanation of Figure 4 and the associated He Awa Whiria framework;
3. Better outline the goal of reviewing frameworks and models for weaving Indigenous knowledge with Western science in the Introduction;
4. Streamline the article by condensing and removing extraneous language.

On the following pages, we address general comments from reviewers and provide a table that includes specific and technical reviewer comments, our explanation for changing or not changing the original text, and any modifications made. We also provide two .pdf versions of our updated manuscript: one with tracked changes and one without.

We also became aware of additional relevant literature since the original submission data of our manuscript and felt it appropriate to add in these references:

1. Cano Pecharroman, L.: Rights of Nature: Rivers That Can Stand in Court, *Resources*, 7, 13 pp., doi:10.3390/resources7010013, 2018.
2. Kauffman, C.M. and Martin, P.L.: Constructing Rights of Nature Norms in the US, Ecuador, and New Zealand, *Global Environmental Politics*, 18, 43-62, doi:10.1162/glep\_a\_00481, 2018.
3. Maxwell, K.H., Ratana, K., Davies, K.K., Taiapa, C., and Awatere, S.: Navigating towards marine co-management with Indigenous communities on-board the Waka-Taurua, *Marine Policy*, 111, 4 pp., doi:10.1016/j.marpol.2019.103722, 2020.
4. Wilcock, D. and Brierley, G.: It’s about time: extending time-space discussion in geography through use of ‘ethnogeomorphology’ as an education and communication tool, *Journal of Sustainability Education*, 3, 2012.
5. Wilcock, D., Brierley, G., and Howitt, R.: Ethnogeomorphology: Progress in Physical Geography, doi:10.1177/0309133313483164, 2013.

Again, thank you for managing our manuscript and for facilitating the involvement of our reviewers; we greatly appreciate their feedback.

Sincerely,

Clare Wilkinson, on behalf of the authorship team.

**Responses to Reviewer 1, Carolina Londono**

General Comments

*The paper presents a review of existing frameworks and models that have been used to incorporate Aotearoa Maori knowledge in New Zealand. It highlights case studies to exemplify how the frameworks work. It considers how the existing frameworks and studies apply to geomorphology and discuss the implications for studies outside of NZ. This is a high-quality review, it is well written and relevant. The frameworks presented should be a model for the US and the world where non-indigenous geoscientists wish to engage in research with indigenous peoples or their lands.*

Thank you.

Specific and technical comments

Reviewer Comment	Original Line Number	Author Comment	Author Revision	New Line Number
I appreciate the words in the Maori language. But I found it taxing and distracting to go back and forth looking for the meaning.	Throughout	Agree	We have added short English translations for Māori terms where appropriate.	Throughout
Also, including a line or two justifying why using the words in Maori.	N/A	Respectfully Disagree—no change required	We use words in <i>te reo</i> Māori (Māori language) to be inclusive throughout our review. We intend to demonstrate—rather than justify—our dedication to weaving Māori knowledge with Western approaches, and one way to honour Māori is to learn and promote their language.	N/A
What methods did the authors use for this paper?	N/A	Sentence added	Added: “We used archival research, review and <i>wānanga</i> (discussion) to conduct this research.”	85
On line 91, the authors mentioned permissions granted by the University to do the research. What did you have to ask permission for?	91	Sentence added	At the University of Canterbury (PI Wilkinson’s institute), all research conducted by staff or students that involves Māori groups in any way must be approved by the University’s Human Ethics Committee. This literature review is part of Wilkinson’s PhD research, which includes interviews and face-to-face interactions with	91-95

			<p>individuals from different Māori iwi (tribes). Therefore, we had to gain ethics approval before conducting this research. We also felt it is important for readers to know that we complied by the policy of asking permission to discuss mātauranga, and the information provided in the review is not something we can claim as our own.</p> <p>Moreover, it is important to note that gaining permission through Human Ethics Committees helps to safeguard the Intellectual Property of Indigenous peoples. This point was raised by Reviewer 2, and we added a sentence to indicate that our Ethics approval acknowledges our obligation as researchers to respect and protect that Intellectual Property.</p>	
Thus, replace the words resurgence and re-engagement.	46	Change made	<p>Changed “resurgence” to “emergence” and “re-engagement” to “engagement”</p> <p>Note: Also in the abstract (line 10) we replaced “experiencing a resurgence” with “emerging”</p>	45-46
Define “right of nature” to readers unfamiliar.	57	Change made	Definition added	56
Move Table 1 so it appears after the first mention (it appears before so there’s no context for it). Consider adding a guide for pronunciation (phonetic guide)		Agree	Table 1 now has a phonetic guide and appears below the first mention	Page 6, near line 160
What does it mean that: Whakapapa (...) fosters credibility by	176	Change made	We changed “subjects” to “research objectives”. By subjects, we meant the subject	170

establishing connections between researchers and subjects?			of the researcher’s research. We hope “research objectives” clarifies any uncertainty here.	
Section 3.2. Consider making it shorter and clearly showing how this treaty connects to the frameworks.		Partially agree	<p>We felt this section was important for highlighting modern interpretations of the Treaty of Waitangi and how it is being used in research and engagement today. This section is intended to illustrate that the principles of the treaty are being used to guide transformative policy and management schemes, so why can’t we also use the principles in geomorphic research?</p> <p>We also felt it was important to establish the context for research in Aotearoa-NZ, which is guided by this governing document.</p> <p>Having said that, we condensed section 3.2 by removing section heading 3.2.1 and changing the 3.2 section heading to reflect what was in 3.2.1.</p> <p>We added a sentence in the IBRLA framework section (line 410) highlighting the Treaty of Waitangi principles woven throughout the framework.</p>	Section 3.2 (beginning line 199)
Just a comment, giving a river the legal personhood status is the way to go. I celebrate; this!	246	Agree	Thank you!	
Could Fig. 3 be referenced there?	382-383	Agree	Done	374
What is Maori phenomena?	386	Agree	individuals, culturally significant landscapes, values—we have added this in	376-377

<p>How can conclusions be supported by both streams when one of the streams may lack the tools or paradigms of the other? What does it mean that both streams have to support findings? This is not clear to me.</p>	<p>426</p>		<p>We have changed the language we use here to be more consistent with the language used in our review of the other two frameworks. We now say: "Ultimately, when research conclusions are drawn, they must represent co-creation of knowledge using both streams."</p>	<p>423</p>
<p>States that the method allows western science to stay true to the scientific method. Is this different from the other two? What do you mean when you say that there is no "hindrance" in using the scientific method for the other two?</p>	<p>429</p>	<p>Changes made</p>	<p>In regard to the He Poutama Whakamana and IBRLA frameworks, we changed the use of "hindrance" to "maintaining integrity". All frameworks allow the scientific method to be used.</p> <p>Historically, one of the biggest reasons for scientists to hesitate to include Indigenous knowledge in their research was the concern that Indigenous knowledge might interfere with the scientific method. We feel it is important to demonstrate that Indigenous knowledge and Western science can work together without undermining each other; we wanted to be explicit about the ability to still use the scientific method while weaving Indigenous knowledge into research projects.</p> <p>We have removed the explicit mention of the scientific method in the He Awa Whiria framework and instead use terms such as "the Western science paradigm" and "Western science analysis". We maintain our usage of the scientific method in the He</p>	<p>Paragraph beginning line 424</p>

			Poutama Whakamana and IBRLA frameworks.	
Figure 4: This figure needs more explanation. For example, What do the turquoise lines represent? Are we trying to connect the baskets? Do the arrows end in a particular place for a particular reason? And what do the horizontal double head arrows represent? And why using weaved baskets to represent both knowledges (i.e., western and Maori)	Figure 4	Agree	Thank you for this comment. We have added a better explanation of the imagery in the figure and why those symbols are significant (including the baskets). In the caption to Figure 4, we now state that the turquoise lines represent knowledge exchange and development throughout the research programme.	Section 4.1.3 and Figure 4 (beginning line 411)
Paragraph starting in 549 states that non-Maori researchers could include Maori values. This raises questions for me. This could lead to cultural misrepresentation or cultural appropriation of knowledge. How are westerners going to interpret the Maori values when they are not part of that culture? I suggest revising this idea, and changing the wording to make it a REQUIREMENT of having a Maori researcher on the project, instead of a desirable situation.	549-	Partially Agree	Thank you for this valuable comment.  We believe that “requiring” Māori participation in research runs the risk of perpetuating colonizing practices. We believe it is best for Māori communities to choose their level of involvement. The text relating to this comment remains unchanged.  We have however added an indication of this important point in a later part of the text, where we discuss resources for initiating research projects with Māori (see lines 593-597).	572; 593-597
Talks about “flexible” research methods. I’m concerned that this could translate as	615	Agree	Thank you for this comment— changed “flexible” to “adaptive” as you suggest.	620

making science less rigorous or lowering its quality. I know that's not what is meant. I'd suggest changing 'flexible' to inclusive, adaptive or culturally responsive research methods.				
Besides adapting, or extrapolating, the Maori models to other parts of the globe, this article shows how researchers and indigenous peoples can develop frameworks and models particular for their culture. I would add that as a contribution.	658	Agree	Thank you—we have added this in.	659-661

**Responses to Reviewer 2, anonymous**

**General Comments**

*The title of the paper refers to "Matauranga Maori in geomorphology" or in other words the Knowledge held by Maori in the science of geomorphology or geomorphic processes. The second part of the title is confusing, and could be reworded to "Matauranga Maori in Geomorphology: existing frameworks, case studies and recommendations for incorporating Indigenous Knowledge in earth science". The other interpretation of the first part of the title, which first drew me in, was the thought that the paper would review actual Matauranga Maori knowledge of geomorphic processes and phenomenon as local people. This knowledge is likely significant, as current occupiers and managers of landscapes, beyond just oral stories of past events or creation stories. The introduction of the paper could better differentiate these two versions of Matauranga Maori in geomorphology, and emphasise that the goal of the paper is to review the frameworks for knowledge incorporation in western science, rather than review the Indigenous geomorphic knowledge itself (but the brief review up front is helpful and insightful).*

Thank you—we certainly don't want the title to be misleading in anyway. We have taken up your suggestion to call the review "Mātauranga Māori in geomorphology: existing frameworks, case studies and recommendations for incorporating Indigenous knowledge in Earth science".

*This in an important article needed to better inform geomorphologists of how to incorporate Indigenous knowledge in their research, or conversely, how to incorporate the science of geomorphology in education and the practical management of land by Indigenous people like the Maori . The latter could*

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*also be emphasised to an equal degree for balanced bicultural research, with suggestions on bidirectional education in contemporary Indigenous cultures that adapt to change.*

We agree that this is an important issue, but we do not feel that discussing it is appropriate for what we are trying to accomplish with our review. The frameworks and models we discuss do seek to achieve balanced bicultural geomorphology research, but we feel that delving into bidirectional *education* is beyond the scope of this review.

*All too often geomorphologists (and other scientists) ignore engagement with Indigenous communities and their traditional ownership of historic estates. They disrespect Indigenous rights to know of, control or guide, and/or participate in research on their traditional land, irrespective of current ownership or tenure or laws requiring it. This is a science version of continued colonisation and suppression. It should be emphasised to the reader that no matter if or how scientists involve Indigenous Knowledge in their proper research, they have an obligation at a minimum to engage with Indigenous people and custodians while conducting research on their traditional land, and most specifically ask permission to conduct the research on traditional land according to local protocols.*

*Asking research permission on traditional land is the first prerequisite, with adding Indigenous community members (or guides) to the team secondary, and gaining the use of Indigenous knowledge then tertiary.*

We agree that there should be a need for researchers to consider how their research may be applicable to/of interest to Indigenous communities. What we have done in our review is stress the need to engage with Indigenous groups when appropriate, and document how it is done in Aotearoa-NZ. We wish to provide general guidance to researchers that will encourage them to discover their own local engagement procedures, without being overly prescriptive. We feel it is most important for researchers to be guided by the experts in their local area. Therefore, we respectfully choose to maintain the way we have discussed engagement with Indigenous communities.

*The issue of Intellectual Property of Indigenous Knowledge also needs to be reviewed more in the paper. Often Indigenous knowledge is owned by the collective of multiple generations (community), past, present and future. Having one or several Indigenous community members or leaders on a research group or board (paid or unpaid) does not automatically give permission to use or include collective Indigenous knowledge for scientific purposes, even if held in the mind and agreed to be shared by one person. Agreement from the collective is often needed, through a Memorandum of Understanding or Intellectual Property agreement with a Council of Elders, Tribal Council, or Indigenous Corporation, or others. This can become a sticky issue, and partially why some scientists often ignore the development of IP agreements. Regardless, this should become an official part of business by researchers around the world as required by funding agreements (Human Ethics even if not studying humans!), and national, regional, local and Indigenous governments. It would be great if the authors could convey some of these issues to readers, many of which are naïve to the issues.*

Thank you for this comment. We feel that this point is perhaps a bit too far down the chain of engagement to include in our paper at length. We agree that this is incredibly important and have added a sentence in our introduction explaining why we had to gain Human Ethics permission to conduct our research, hoping that it illustrates this important step. Our paper aims to encourage geoscientists to embark on research journeys with Indigenous groups and, as we have stressed, we implore researchers to discuss their research ideas *early* with staff at their University or Research institute who are skilled in appropriate engagement processes. Conversations about the IP of Indigenous knowledge will stem from those discussions with cultural engagement advisors. However, we greatly value and appreciate this



comment. The last 3 sentences of our introduction now read: “We acknowledge that the *mātauranga* presented here is not our own, and that we have gained approval through the Human Ethics Committee at the University of Canterbury (Christchurch, NZ) to conduct this research. In all cases, including our own, this approval is required in order to respect the Intellectual Property of Indigenous peoples. We herein acknowledge the *mana whenua* (traditional authorities) of Aotearoa-NZ as the rightful holders of *mātauranga*.” The 2<sup>nd</sup> of the 3 provided sentences is new and the 1<sup>st</sup> and 3<sup>rd</sup> are from the original manuscript.

*The section titles and outline are key to improve upon. The sections headings are as follows with suggested additions and changes in italics to the titles below. Some headings could be deleted or combined.*

Thank you for these suggestions (we have moved this comment from the specific/technical corrections to here, where it is easier to address). We have made some changes where we agree that your suggestion is appropriate. We have maintained the original form of some headings where we feel further text in the heading is clunky. We removed one section heading (3.2.1) but changed the 3.2 section heading to reflect what was previously in 3.2.1. Because this is a review, we do feel the need to maintain our heading and subheading structure, so that the content of each section is clear.

<i>Reviewer Suggestion</i>	Author comment	Current form
<i>1 Introduction</i>	No change required	1 Introduction
<i>2 Overview of International research at the interface of Indigenous knowledge and science</i>	No change required	2 Overview of international research at the interface of Indigenous knowledge and geoscience
<i>3 Mixed-method geoscience research in contemporary Aotearoa-NZ</i>	No change required	3 Mixed-method geoscience research in contemporary Aotearoa-NZ
<i>3.1 Te Ao Maori (the Maori worldview)</i>	No change required	3.1 <i>Te Ao Māori</i> (the Māori worldview)
<i>3.1.1 Whakapapa and tikanga (Validity through ancestry)</i>	Changed	3.1.1 <i>Whakapapa</i> and <i>tikanga</i> (validity through ancestry)
<i>3.1.2 Mātauranga Maori (Indigenous Knowledge)</i>	Changed	3.1.2 <i>Mātauranga</i> Māori (Māori knowledge)
<i>3.1.3 Kaitiakitanga (Well-being of people and environment)</i>	Changed	3.1.3 <i>Kaitiakitanga</i> (Well-being of people and environment)
<i>3.2 Obligations of the Aotearoa New Zealand government to Maori</i>	No change required	3.2 Obligations of the Aotearoa New Zealand government to Maori through the Treaty of Waitangi
<i>3.2.1 The Treaty of Waitangi (Maori and Crown as legal partners)</i>	Section header removed	--
<i>3.2.2 The Treaty in practice</i>	Changed subheading number	3.2.1 The Treaty in practice
<i>3.2.2.1 Te Manahuna Aoraki Project (Government Consolation)</i>	No change required (except subheading number)	3.2.1.1 <i>Te Manahuna Aoraki</i> Project

3.2.2.2 <i>Te Awa Tupua (Rivers at Legal People)</i>	No change required (except subheading number)	3.2.1.2 <i>Te Awa Tupua</i>
3.3 <i>Woven spaces at the interface of Mātauranga Māori and science</i>	No change required	3.3 Woven spaces at the interface of <i>mātauranga</i> Māori and science
3.3.1 <i>The relationship between Mātauranga and science</i>	No change required	3.3.1 The relationship between <i>mātauranga</i> and science
3.3.1.1 <i>Indigenous knowledge versus values</i>	Changed	3.3.1.1 Indigenous values
3.3.2 <i>Mutual research needs and benefits (Indigenous Management Plans)</i>	Slight change	3.3.2 Identifying mutual research needs and benefits
3.3.3 <i>Potential challenges and risks of conducting research at the cultural interface</i>	Changed	3.3.3 Potential challenges and risks of conducting research at the cultural interface
4. <i>Frameworks and models for incorporating Mātauranga Māori alongside in geomorphic research</i>	No change required	4. Frameworks and models for incorporating <i>mātauranga</i> Māori alongside in geomorphic research
4.1 <i>Theoretical Frameworks (Mātauranga Māori in geomorphic research)</i>	No change required	4.1 Theoretical frameworks for including <i>mātauranga</i> Māori in geomorphic research
4.1.1 <i>He Poutama Whakamana (Mirror-images of knowledge and understanding)</i>	Changed	4.1.1 <i>He Poutama Whakamana</i> (mirror-images of knowledge and understanding)
4.1.2 <i>IBRLA (initiation, benefits, representation, legitimation, accountability)</i>	Changed	4.1.2 IBRLA (initiation, benefits, representation, legitimation, accountability)
4.1.3 <i>He Awa Whiria (A Braided Rivers Approach)</i>	Changed	4.1.3 <i>He Awa Whiria</i> (a braided rivers approach)
4.2 <i>Models (Step-By-Step Guide of Including Māori values in geomorphic research)</i>	No change required	4.2 .2 Models for including Māori values in geomorphic research
4.2.1 <i>Mauri model (Sustainability and Cultural Bonds to the Environment)</i>	No change required	4.2.1 <i>Mauri</i> model
4.2.1.1 <i>Transferability to geomorphology (Mauri model)</i>	Changed	4.2.1.1 Transferability to geomorphology ( <i>Mauri</i> model)
4.2.2 <i>Cultural Flow Preference Study (Cultural Practices and River Flow)</i>	No change required	4.2.2 Cultural Flow Preference Study
4.2.2.1 <i>Transferability to geomorphology (Cultural Flow)</i>	Changed	4.2.2.1 Transferability to geomorphology (CFPS)
4.2.3 <i>Sustainability Assessment Method (Values Associated with Waterway Health)</i>	No change required	4.2.3 Sustainability Assessment Method

<i>4.2.3.1 Transferability to geomorphology (Sustainability Assessment)</i>	Changed	4.2.3.1 Transferability to geomorphology (SAM)
<i>5. Critical assessment of existing frameworks and models in different conditions</i>	No change required	5. Critical assessment of existing frameworks and models in different conditions
<i>5.1 Knowledge versus values (Revisited)</i>	Changed	5.1 Framework recommendations for subdisciplines
<i>5.2 Framework and Model recommendations for Geomorphology subdisciplines</i>	No change required	5.2 Model application to include Indigenous values
<i>5.3 Guiding resources for initiating projects in Aotearoa-NZ</i>	No change required	5.3 Guiding resources for initiating projects in Aotearoa-NZ
<i>6. Lessons for the international geomorphology community</i>	No change required	6. Lessons for the international geomorphology community
<i>6.1 Direct benefits to geomorphology</i>	No change required	6.1 Direct benefits to geomorphology
<i>6.2 International application of Aotearoa-NZ bicultural research frameworks</i>	Changed	6.2 International application of Aotearoa-NZ bicultural research frameworks and models
<i>6.3 The benefit of Indigenous Knowledge and Geomorphology Science in Society</i>	Changed	6.3 Benefits of Indigenous knowledge and geomorphology to society
<i>7. Conclusions and recommendations to geomorphologists</i>	Unchanged	7. Conclusions and recommendations to geomorphologists

Specific and technical comments

Reviewer Comment	Original Line Number	Author Comment	Author Revision	New Line Number
Overall, the paper is fairly long, with many sub-headings, and is easy to get lost within...Please condense and remove any extraneous word, sentences, sections, or references, where possible?	N/A	Changes made	We have removed some repeat references and unnecessary words/sentences/phrases.	Throughout

<p>So sentence intros like “As discussed earlier” or “As previously mentioned” do not help, as one of many examples. As another of many examples Line 390 should be reduced “He Poutama Whakamana follows a kaupapa Maori research approach,. Kaupapa Maori , described in depth by Smith (2012), can be understood as research that is “culturally safe” and that takes place within a Maori worldview (Irwin, 1994 as cited in Smith, 2012). Keep the sentences simple and straight forward and non-redundant.</p>	<p>N/A</p>	<p>Changes made</p>	<p>We removed as many sentence intros like this as we felt appropriate.</p>	<p>Throughout</p>
<p>The Table of Maori terms and names is very useful. However for the non-New Zealand reader, it is very hard to read the text and Maori terms and constantly go back to the table. It would be helpful to conduct two things: 1) make all Maori terms italics or otherwise to highlight to the reader the difference between English and written Maori (similar to what has been done with PNG language in the paper), and 2) at the end of key Maori words</p>	<p>Throughout</p>	<p>Agree</p>	<p>We have added short English translations for Māori terms where appropriate, and have italicised Māori terms.</p>	<p>Throughout</p>

to have the short definition in brackets, like Iwi (tribe).				
The authors in places due this with commas, but the sentences get too complex. . . . Line 237, For mana whenua, spiritual values of the Te Manahuna, the Mackenzie basin, are held as a priority to be conserved, which may be challenging to communicate to their partners. It would be easier to read as follows. For Mana whenua (people with with authority), spiritual values of the Te Manahuna (the Mackenzie basin) are held as a priority to be conserved, which may be challenging to communicate to their partners.	Throughout	Agree	We have made the appropriate change.  Note: we also changed a similar occurrence of comma and em dash usage in the abstract to include just parentheses.  Note: again, we changed a similarly clunky sentence in original manuscript lines 99-102.	Throughout
Maori terms could also be capitalised, Iwi (tribe) to make stand out, if appropriate for written Maori ?	Throughout	Respectfully disagree	We have italicised all Māori terms to make them stand out.	Throughout
Please better define the difference between a Framework and Model earlier on in the paper. Overall these uses are very confusing to a new reader. The authors cover the difference better in section 5.2, but this needs to happen earlier in the paper (introduction) in a	Throughout	Agree	We provide a short definition of framework and model in the introduction (similar to the definitions included in Table 2).  We also provide more explicit definitions of “framework” and “model” at the beginning of section 4.	Section 4, beginning line 343

<p>more concise and clear fashion. The authors mention 3 frameworks and models each, but there are lots of similarities and differences. In Table 2, a Framework is defined as a methodology, and Model is defined as a method. Theoretical vs actionable is key, but the Theoretical frameworks are actionable depending on the user and interpretation. Methodology as a general research strategy, and method as a tool to answer a question.</p>				
<p>In some place this use [of framework and model] is even mixed up, such as Line 354 “The models proposed by Smith (1992, 2012) can be thought of as methodologies, or guiding principles. . . .”. In this case and usage the sentence should read “The framework proposed by Smith (1992, 2012) can be thought of as methodologies, or guiding principles. . . .”.</p>	<p>Throughout</p>	<p>Changes made</p>	<p>Thank you for this helpful comment. We have made sure that we do not mix up the usage of “framework” and “model” in the revised manuscript.</p>	<p>Throughout</p>
<p>Please educate the reader why they are labelled or grouped as is, both in the abstract, introduction, and also the main sections such as section 4 in</p>	<p>Throughout</p>	<p>Changes made</p>	<p>We have included more explicit definitions/explanations of the use of “framework” and “model”.</p>	<p>Throughout</p>

<p>paragraph Line 355 and 370, and in section 4.2. Section 5.2 does a better job at describing these differences.</p>				
<p>In some locations the authors intermix geologic, geomorphic(ology) and earth science. Even in the title. And at times river science and health and ecology. The paper and journal focus is on geomorphology, perhaps leave it as that and omit the others. Geomorphology is pretty broad and inclusive. Just refer to the broader earth science when talking about wider applications, and the more specific sciences like river health and environmental flow where appropriate for the example reference.</p>	<p>Throughout</p>	<p>Changes made</p>	<p>We have clarified our use of these terms and make sure we use the appropriate term in each location.</p> <p>Note: We reorganised the paragraph beginning on Line 142 so that the mention of ecological studies is later in the paragraph rather than at the beginning. This has the effect of showing ecology is not the main topic of the paragraph, while still highlighting the importance of mentioning that Indigenous knowledge has been incorporated into ecology studies and that geomorphology might be imbedded in those studies.</p>	<p>Throughout</p>
<p>This sentence needs to be broken into two. We then introduce Te Ao Maori (the Maori world), discuss obligations of the New Zealand government to Maori , and present frameworks for conducting mixed-methods scientific research with iwi and hapu (tribes and family groupings) the principle political units with whom scientists</p>	<p>80-83</p>	<p>Agree</p>	<p>The sentences now read: We then introduce <i>Te Ao Māori</i> (the Māori world) and some Māori concepts relevant to geomorphology. We discuss obligations of the New Zealand government to Māori groups (i.e. <i>iwi</i> and <i>hapū</i>, tribes and sub-tribes, which are the principle political units with whom scientists engage in Aotearoa-NZ). We present three theoretical frameworks</p>	<p>79-83</p>

engage) in Aotearoa-NZ in this space.			(methodologies or general research strategies) and three value-based models (methods for answering research questions) for conducting mixed-method bicultural research.	
This sentence is vague. We then provide case studies of framework development and recommendations for framework implementation in geomorphology research.	83-84	Somewhat agree; changes made	We then provide case studies of model development and recommendations for implementation in geomorphology research.	83-84
Line 287 paragraph is connected to the discussion in Line 300 paragraph in the next section. Repetitive and confusing to repeat. Please clarify and simplify or consolidate.	287-305	Agree	We revised these two paragraphs so that the first is more focused on the relationship between mātauranga and science while the second is more focused on Indigenous knowledge and values. The second paragraph is now more concise.	283-298
Figure 3. Make sure that this image is high enough resolution in print to be readable in a condensed format in a journal paper. Even in this full page format it is hard to read, and the journal may not print it as a full page.	Figure 3, page 16		Thank you—it is 400 dpi (will discuss this further with the associate editor if necessary).	Figure 3, page 16
Knowledge of	431	Changed	Changed to “allowing the two knowledge streams to operate...”	428
Sections 5.1 Knowledge versus values (Revisited) and 5.2 Framework and Model recommendations for Geomorphology subdisciplines should	538-578	Agree	We removed the original manuscript section with the heading “ 5.1 Knowledge and values revisited” and distributed the information between the revised sections 5.1	Section 5, starting line 529



<p>be renamed, as the first really covers model application to capture values, while the second focuses on frameworks. Same with the Section 5 title, which focuses on both frameworks and models. It just gets confusing about what each paragraph or sub-section is referring to.</p>			<p>and 5.2. These revised sections are: “5.1 Framework recommendations for subdisciplines” and “5.2 Model application to include Indigenous values”</p> <p>Note: We have also changed the heading for section 5 to: “5. Embarking on the bicultural research journey” to better reflect the sections that fall beneath it.</p>	
<p>6.1 Direct benefits to geomorphology. Rather than just focusing on knowledge of physical events to benefit geomorphologist, the more common international benefit of working with Indigenous people is learning from their current intricate knowledge of the environment and physical and cultural and biological landscapes. If one wants to learn about all the springs in a catchment, who better to ask than local Indigenous people? Or locations of rock outcrops with valuable resources or tools? Or unique species isolated above geologic barriers? The paper missed out on a wealth of knowledge beyond past events.</p>	<p>605-</p>	<p>Agree</p>	<p>Added in a few sentences to the second paragraph in this section to talk about contemporary Indigenous knowledge guiding geomorphic research. In the period of time between submitting our original manuscript and receiving reviews, we became aware of a publication by Wilcock et al. (2013) that discusses a concept they call ‘ethnogeomorphology’. We briefly discuss this concept here to further address your comment.</p>	<p>Section 6.1, specifically lines 612-619.</p>

<p>The key recommendation should be to encourage geomorphologists interested in working with Indigenous communities to consult directly with Indigenous communities and their self-governance institutions. There is a surprising level of diversity in governance capacity of Indigenous communities around the globe. Direct consultation is best, with support of other programs and experts of course where needed.</p>	<p>685</p>	<p>Respectfully disagree</p>	<p>We believe that consultation with engagement support teams is the best way for geomorphologists to begin a bicultural research journey. The reason for this is because, as you state, there is a wide diversity in governance capacity of Indigenous communities around the globe, meaning that they will all have different expectations surrounding engagement protocols. We cannot provide specific engagement advice that would suit all Indigenous communities around the globe. Therefore, we advise researchers to talk to people at their own institutions who are knowledgeable about engagement protocols in their local area.</p> <p>In many cases, Human Ethics must be approved before researchers can engage with Indigenous communities. Cultural advisors at universities and research institutes will be able to advise researchers on how to gain ethics approval. In our experience, there are many steps that must occur first before researchers directly engage with Indigenous groups.</p>	<p>N/A</p>
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