

Editor Comment:

I would like to see a complete reply to Ref.2 comments (e.g. second and third paragraphs), in particular I would like a clear answer to the question of what are the differences--in methods, results and interpretations--between this contribution and Wernette et al., 2018.

Author Response:

Summary: The current manuscript is distinct from Wernette et al., 2018 in methodology, results, and interpretations. While the following information was detailed in the previous response to reviewer comments, the current response to the editor feedback is meant to better articulate the several important distinctions between the current manuscript and Wernette et al., 2018. Since all of the following information and edits were included in the previous rounds of edits in response to Reviewer 1 and 2 comments, the manuscript remains unchanged from the previously revised version.

Using ARFIMA modelling, not wavelet decomposition or bicoherence, the current manuscript demonstrates that paleo-channels in the framework geology affected alongshore patterns in beach and dune morphology within distinct zones of influence, while Wernette et al., 2018 was focused on confirming the location of paleo-channels and their impact on beach-dune morphology only within a given channel. The previous paper did not explore what the potential alongshore zone of influence was for a given paleo-channel because the methodology was incapable of such analyses. Specifically, the current manuscript is the first paper to identify the alongshore distances that paleo-channels affected beach-dune morphology, as noted in the revised text:

(Lines 86-87) *“The purpose of this paper is to test the hypothesis that relict infilled paleo-channels in the framework geology of a barrier island play a significant role and have an asymmetric influence on the alongshore variation in beach and dune morphology at a range of alongshore length scales.”*

As described in the previously updated text and responses to reviewer comments, the Abstract was revised to articulate the differences between the current manuscript and Wernette et al., 2018:

(Lines 6-7) *“This paper builds on previous research by demonstrating that paleo-channels in the irregular framework geology can have a directional influence on alongshore beach and dune morphology.”*

(Lines 18-20) *“The spatial patterns in LRD surface morphometrics and framework geology variations demonstrate that the influence of paleo-channels can be asymmetric (i.e. affecting beach-dune morphology preferentially in one direction alongshore) where the alongshore sediment transport gradient was unidirectional during island development.”*

Differences in Methodologies: Previous work was focused on confirming the location of paleo-channels in the framework geology and examining how these infilled channels affected the modern barrier island geomorphology *within the channels themselves*. Neither wavelet decomposition nor

bicoherence analyses, as used in Wernette et al., 2018, are capable of being used to determine the alongshore zone of influence for a given feature. Wavelet decomposition only provides information on relationships between co-located variables, and bicoherence only examines frequency relationships within one or more data series. ARFIMA models, as used in the current manuscript, can be used to identify how far alongshore a given paleo-channel influenced barrier island geomorphology. ARFIMA is completely different than wavelet decomposition and bicoherence techniques, does not rely on any of Wernette et al., 2018 methods, and is capable of distinguishing between fine- and broad- scale coastal processes and geomorphology.

The previously updated manuscript and response to reviewer comments included differentiation between the methodologies of Wernette et al., 2018 and the current manuscript:

(Lines 158-160) *“The current paper expands on previous research by adapting economic forecast models to determine how paleo-channels in the framework geology have influenced beach and dune evolution and whether this influence is directional and scale-dependent.”*

(Lines 208-211) *“Previous research used EMI surveys to confirm the location of several paleo-channels and begin to quantify their influence on coastal geomorphology EMI surveys (Wernette et al., 2018; Weymer, 2016), while the current paper aims to determine the alongshore influence (direction and scale) of the paleo-channels.”*

(Lines 287-293) *“While wavelet decomposition can provide insight into relationships between two variables in the same location (Wernette et al., 2018), utilizing ARFIMA as a sliding window across multiple spatial scales can shed light on relationships that exhibit a lag in one or both directions. The advantage of this new approach is its application to examine alongshore influences of various natural and anthropogenic features (e.g. jetties, seawalls, groin fields, paleo-channels, and/or headlands) and identify their effective zone(s) of influence on coastal processes and geomorphology.”*

Differences in Results: Although the ARFIMA plots appear similar in structure to wavelet plots, the methodology used to derive the values and values themselves are completely different than wavelet decomposition and bicoherence analysis. The current manuscript isolates the d parameter in ARFIMA models fit to barrier island geomorphology data series as a way of identifying the alongshore zone of influence for paleo-channels in the framework geology. The simplest approach to interpreting variations and patterns in the d parameter values is by visualizing it similar to a wavelet decomposition plot, with scale on the y-axis and alongshore location on the x-axis.

Differences in Interpretations: As described in the updated text and in response to the previous reviewer comments, the previously updated manuscript describes the differences between the current paper and previous work at the following locations:

(Lines 158-160) *“The current paper expands on previous research by adapting economic forecast models to determine how paleo-channels in the framework geology have influenced beach and dune evolution and whether this influence is directional and scale-dependent. Identifying these spatial lags, their spatial scale(s), and their lag direction(s) is the first step toward integrating this information into morphodynamic prediction models.”*

(Lines 287-293) *“While wavelet decomposition can provide insight into relationships between two variables in the same location (Wernette et al., 2018), utilizing ARFIMA as a sliding window across multiple spatial scales can shed light on relationships that exhibit a lag in one or both directions. The advantage of this new approach is its application to examine alongshore influences of various natural and anthropogenic features (e.g. jetties, seawalls, groin fields, paleo-channels, and/or headlands) and identify their effective zone(s) of influence on coastal processes and geomorphology.”*

(Lines 346-348) *“Patterns in the subsurface framework geology LRD plot demonstrate that the framework geology is self-similar at broader scales, and that this structure varies alongshore at finer alongshore length scales which correspond to the scale of the previously identified paleo-channels.”*

(Lines 465-467) *“This paper presents new information supporting the hypothesis that paleo-channels in the framework geology interact with alongshore currents to drive asymmetries in barrier island geomorphology and that the scale of influence is ultimately limited.”*