



Deposited via The University of Sheffield.

White Rose Research Online URL for this paper:

<https://eprints.whiterose.ac.uk/id/eprint/216168/>

Version: Published Version

Proceedings Paper:

Fowler, A., Ng, F. and Kember, G. (2024) Towards a theory for the formation of sea stacks. In: EGU General Assembly 2024. EGU General Assembly 2024, 14-19 Apr 2024, Vienna, Austria. Copernicus Publications. Article no: egu24-6338.

<https://doi.org/10.5194/egusphere-egu24-6338>

Reuse

This article is distributed under the terms of the Creative Commons Attribution (CC BY) licence. This licence allows you to distribute, remix, tweak, and build upon the work, even commercially, as long as you credit the authors for the original work. More information and the full terms of the licence here:

<https://creativecommons.org/licenses/>

Takedown

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.

EGU24-6338, updated on 16 Aug 2024

<https://doi.org/10.5194/egusphere-egu24-6338>

EGU General Assembly 2024

© Author(s) 2024. This work is distributed under the Creative Commons Attribution 4.0 License.



Towards a theory for the formation of sea stacks

Andrew Fowler^{1,2}, Felix Ng³, and Guy Kember⁴

¹University of Limerick, Ireland (fowler@maths.ox.ac.uk)

²University of Oxford, UK

³University of Sheffield, UK

⁴Dalhousie University, Canada

Sea stacks are isolated cliff-bound columnar islands, which are formed as shore-line cliffs are eroded by ocean wave action. We have developed a theory which aims to explain how they can be formed, and in this talk we will provide a description of the mathematical model in its present form, some analytic insights into its behaviour, and some numerical computations of the solutions.

The key idea in the model is that eroded cliffs provide shore-line debris which enhance erosive power during storms, thus providing a positive feedback which enables spatial instability of a uniformly receding cliff face. Important ingredients in the model are along-shore boulder transport, and a newly-introduced 'cliff energy length', both of which provide regularising effects on what would otherwise be an ill-posed (and thus physically meaningless) model.

We provide analytical and numerical results which may provide insight into the formation of headlands and inlets, and we also discuss the potential application of the model to the formation of sea stacks.