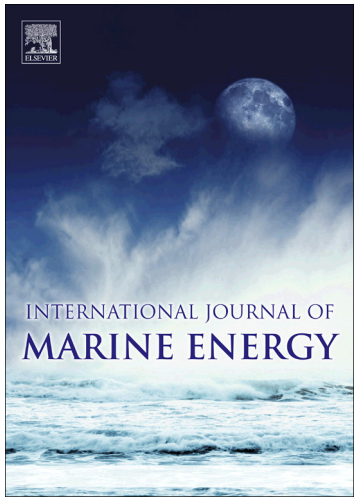

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PII: S2214-1669(17)30069-3
DOI: http://dx.doi.org/10.1016/j.ijome.2017.08.004
Reference: IJOME 171

To appear in:

Received Date: 14 November 2016
Revised Date: 17 July 2017
Accepted Date: 7 August 2017

Please cite this article as: A.S. Dimakopoulos, M.J. Cooker, T. Bruce, The influence of scale on the air flow and pressure in the modelling of Oscillating Water Column Wave Energy Converters, (2017), doi: http://dx.doi.org/10.1016/j.ijome.2017.08.004

The influence of scale on the air flow and pressure in the modelling of Oscillating Water Column Wave Energy Converters

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Abstract

In this work, air compressibilty effects are investigated during wave interaction with an Oscillating Water Column (OWC) Wave Energy Converter (WEC). Mathematical modelling includes a thermodynamic equation for the air phase and potential flow equations for the water phase. A simple three dimensional OWC geometry with a linear Power Take Off (PTO) response is considered and both the thermodynamic and potential flow equations are linearised. Analysis of the linearised system of equations reveals a nondimensional coefficient which we name "compression number". The flow potential is decomposed into scattering and radiation components, using an analogue of spring-dashpot response and taking into account the additional effects of air compressibility to wave interaction processes. We use these concepts to characterise the relative importance of the air compressibilty effects inside the OWC and to derive novel scaling relations for further investigation of scaling effects in OWC physical modelling. The predictions of the methodology are validated against large scale experimental data, where compressibility effects are evident and further application of the methodology to a realistic OWC geometry is used to demonstrate the

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