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M. Guerra, R. Cienfuegos, J. Thomson, L. Suarez

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# Tidal Energy Resource Characterization in Chacao Channel, Chile

M. Guerra<sup>a,\*</sup>, R. Cienfuegos<sup>b</sup>, J. Thomson<sup>a</sup>, L. Suarez<sup>c</sup>

<sup>a</sup>*Applied Physics Laboratory, University of Washington, Seattle, WA, United States*

<sup>b</sup>*Departamento de Ingeniería Hidráulica y Ambiental, Pontificia Universidad Católica de Chile, Santiago, Chile*

<sup>c</sup>*Marine Energy Research and Innovation Center, Santiago, Chile*

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## Abstract

Chacao Channel is an energetic tidal channel located at the northernmost part of the Chilean Patagonia. The channel has been previously identified as a prospective site for tidal energy extraction, however there has been only a limited understanding of the tidal flows. A new set of field measurements distributed along Chacao Channel is presented here for tidal energy resource characterization, including tidal elevations, tidal currents (in space and time), and turbulence. The field data also are used to calibrate and validate a FVCOM hydrodynamic numerical model of the entire channel, which is then used for tidal energy resource assessment. Field measurements indicate that tidal elevation range increases eastward along the channel, that tidal currents that exceed  $4 \text{ ms}^{-1}$  at some points within the channel, and that turbulence intensity ranges between 5 and 20%. The data and numerical model results are used to estimate the kinetic power density of the tidal currents at Chacao Channel, which is an average of  $5 \text{ kWm}^{-2}$ .

*Keywords:* tidal energy, tidal currents, turbulence, Chacao Channel

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## 1. Introduction

Historically, electricity in Chile has been mainly generated from hydroelectric dams (nearly 80% in the 1980s) [1]. In recent years, hydroelectricity generation has reduced

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\*Corresponding author

*Email addresses:* mguerrap@uw.edu (M. Guerra), racienfu@ing.puc.cl (R. Cienfuegos), jthomson@apl.washington.edu (J. Thomson), leandro.suarez@meric.cl (L. Suarez)

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