An Inverse-Forward Model for Salt Budgets in Glacier Bay, Alaska

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1 Introduction

2 Model Setup

2.1 Governing Equations

The circulation of a Glacier Bay is regulated by several external forcing and constrains: freshwater input, vertical density distribution, wind, tide, and topographic constrains. Topographic constrains include (1) a relatively shallow sill towards the fjord entrance and (2) a relatively narrow channel compared to the length of the fjord. The first constrain conserves the total volume of the fjord;

Volume conservation:

$$0 = F_i + \sum Q_{in} + \sum Q_{out} + \sum W_{in} + \sum W_{out} \tag{1}$$

Salt budgets:

$$\frac{\mathrm{d}}{\mathrm{dt}} S = \sum Q_{in} S_{in} + \sum Q_{out} S_{out} + \sum W_{in} S_{in} + \sum W_{out} S_{out} \tag{2}$$