

Background

Over the last few years, the large-scale hydrological model for South America has been developed by the Large-Scale Hydrology research group at IPH (Instituto de Pesquisas Hidráulicas)/UFRGS (Universidade Federal do Rio Grande do Sul), Brazil (<https://www.ufrgs.br/lsh/>). This model is based on the MGB (Modelo de Grandes Bacias) hydrological-hydrodynamic model and it has been used for several studies in the continent. MGB flood inundation estimates have been mostly used and accessed in studies related to large wetlands. However, there are still open questions related to flood mapping with the model: **1) How reliable the flood mapping capabilities of the proposed continental modelling framework are in the context of local relevance for societal applications?** **2) How comparable are the continental model results to a standard local approach, based on a regional version of MGB?** In a recent partnership between the Brazilian National Water Resources Agency (ANA - Agência Nacional de Águas e Saneamento Básico) and IPH/UFRGS this topic has been addressed for Uruguay, Jacuí, Caí and Sinós rivers, placed in southern Brazil, South America. The flood maps generated from both models (continental and regional) were compared to estimates based on satellite imagery (Landsat, Sentinel 1 and 2, PlanetScope) for selected flood events. Results suggested that both models are in good agreement with observed satellite images and that the continental scale flood inundation results are comparable to the regional scale model, with fit-metric values ranging between 0.2 and 0.7 for the studied rivers and floods.

This work presents part of the results obtained during the research project under development by the Hydraulic Research Institute (IPH) from the Federal University of Rio Grande do Sul (UFRGS) and the Brazilian National Water Resources Agency (ANA), under project ID “TED 05/2019/ANA - COOPERAÇÃO EM TECNOLOGIAS PARA ANÁLISES HIDROLÓGICAS EM ESCALA NACIONAL”.

Study Area

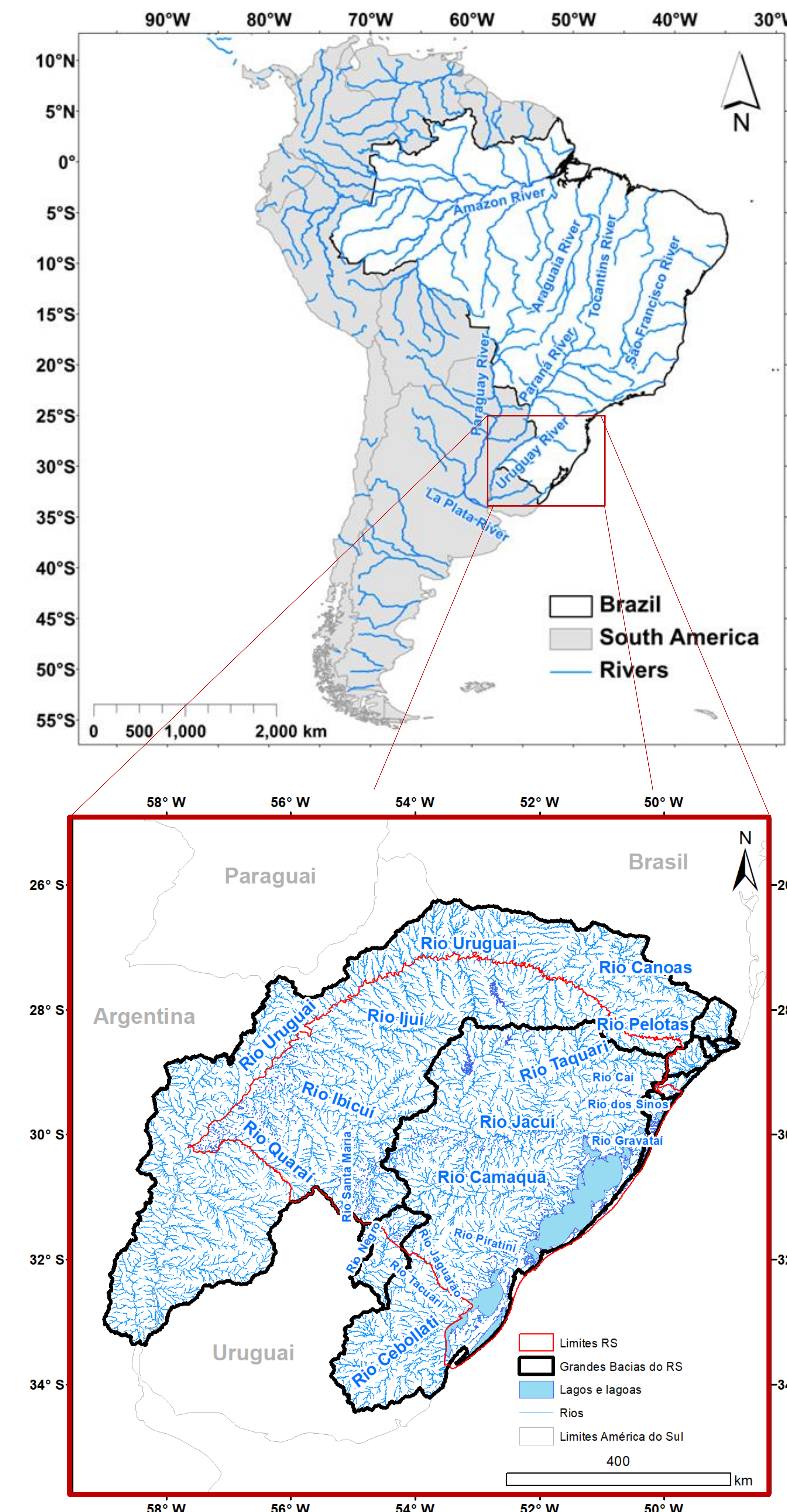


Fig 1. Rio Grande do Sul Hidrológico (RSH) and its location in the South American continent.

Results

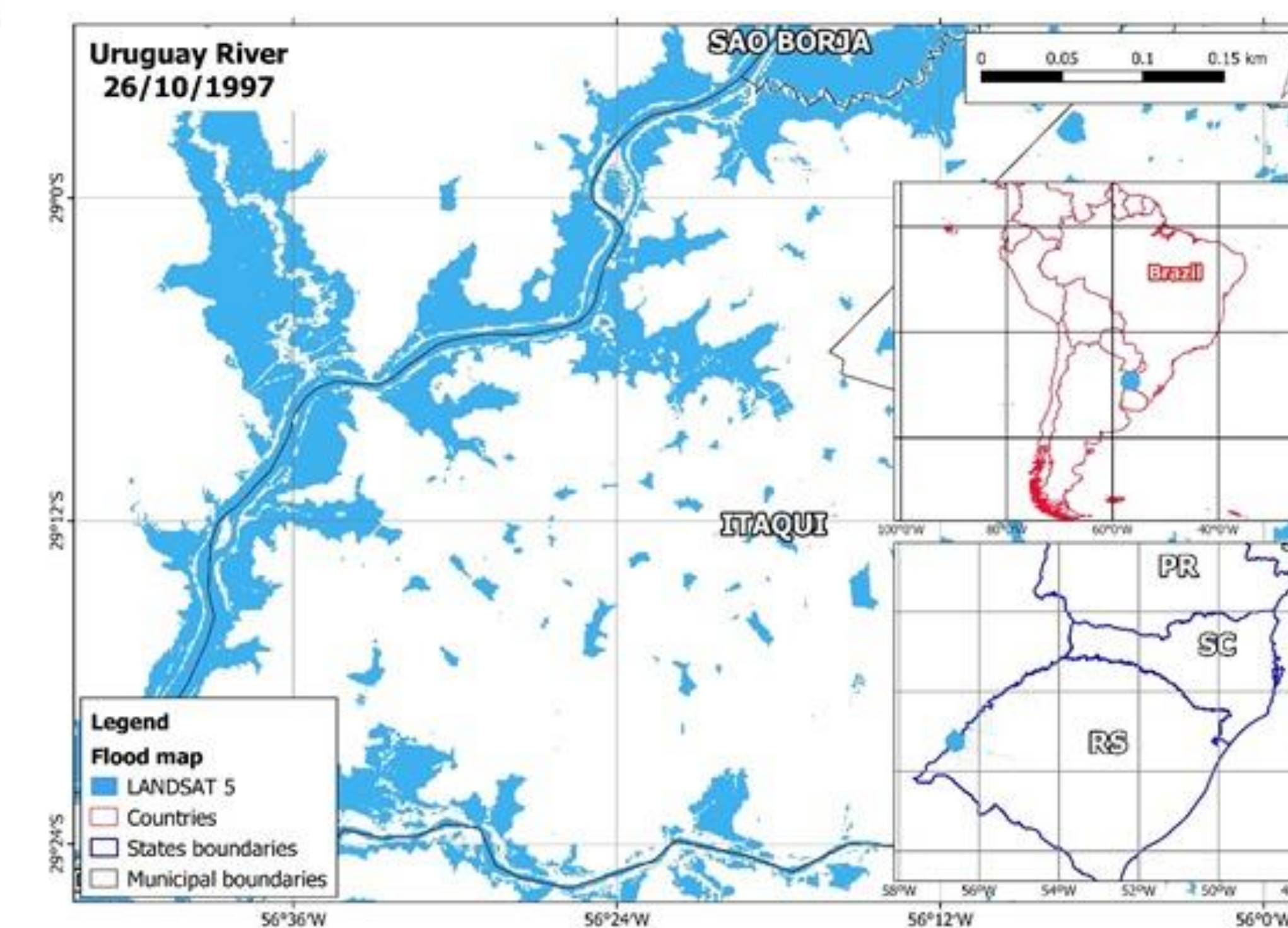


Fig 2. Landsat 5 estimate flood map.

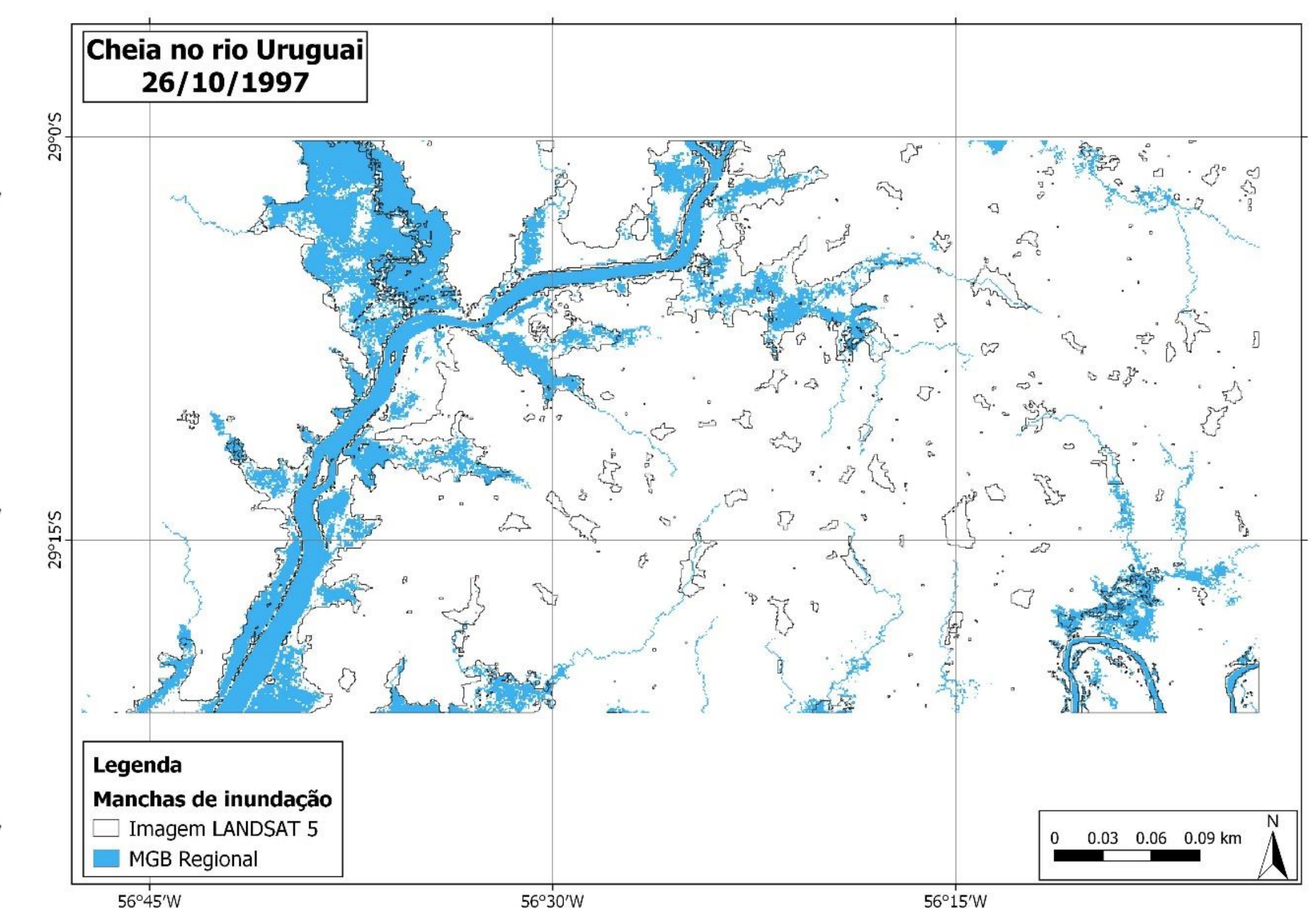


Fig 3. Regional model flood map.

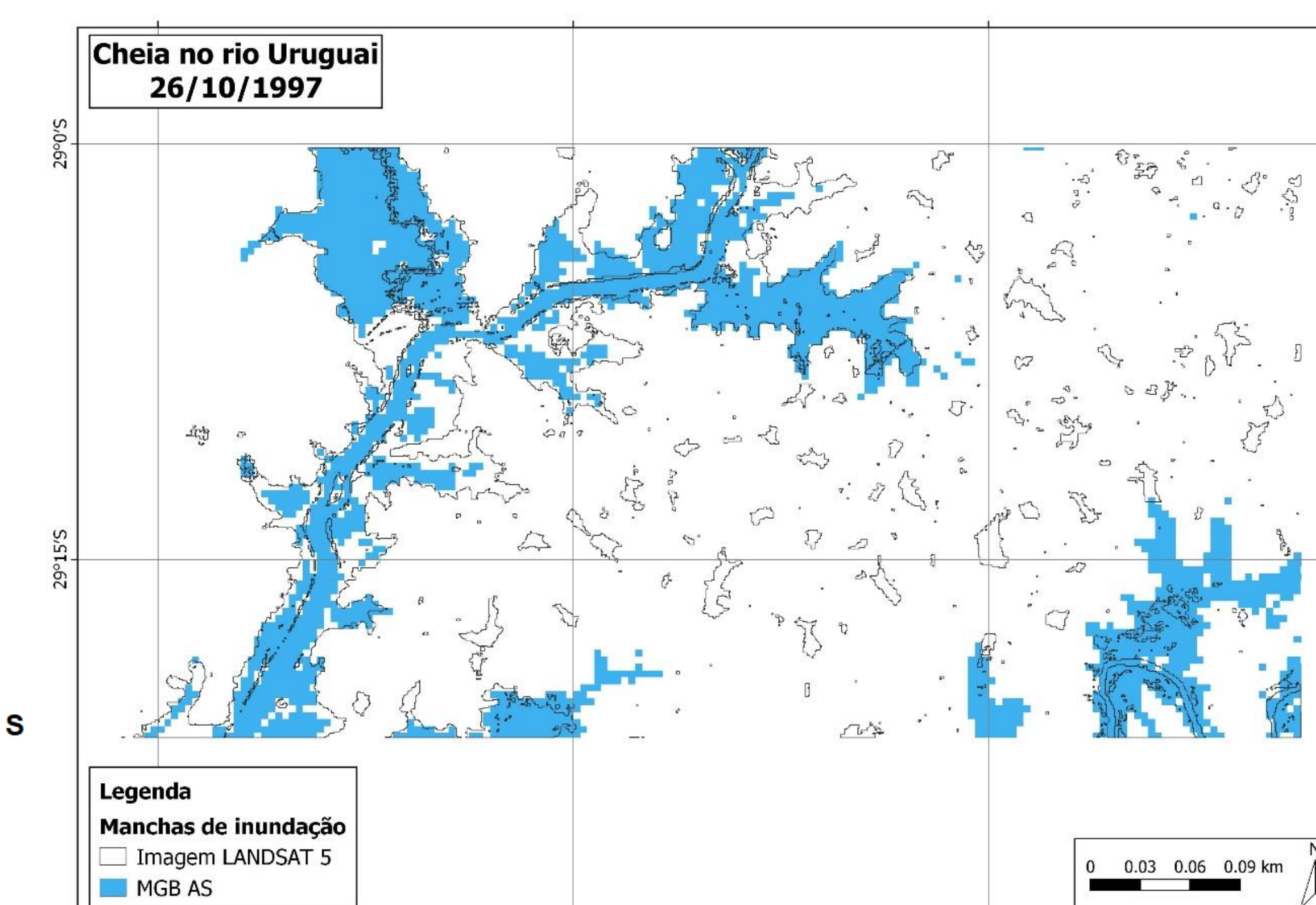


Fig 4. Continental model flood map.

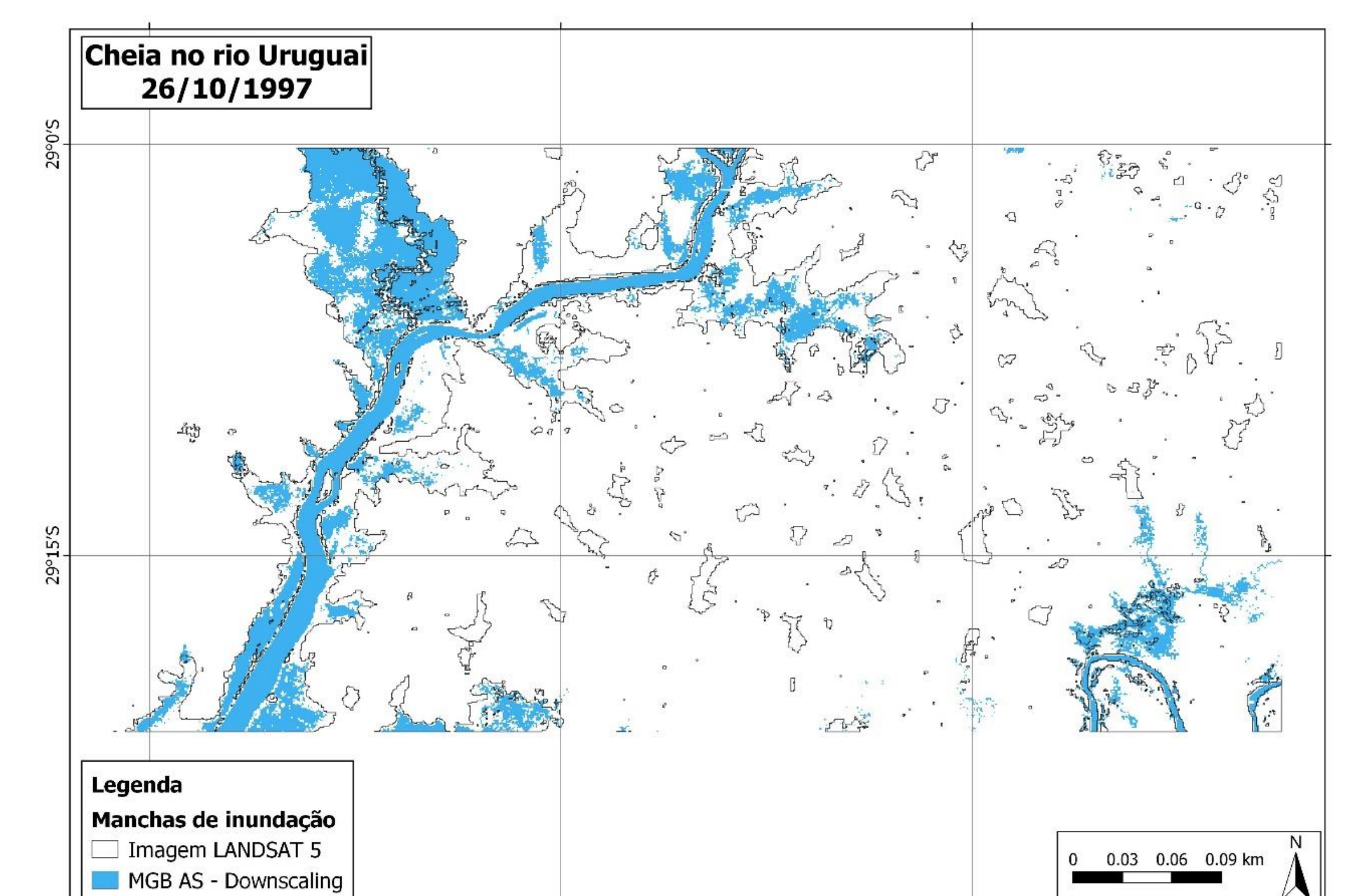


Fig 5. Continental model downscaled.

Table 1. Summary of Fit Metric Results for 24 floods in the study area.

Model	Average Fit Metric	Standard Deviation
HAND Global	0.350	0.207
MGB AS MERGE	0.366	0.199
MGB AS GPM	0.373	0.205
MGB AS Downscaled	0.373	0.214
MGB Regional	0.371	0.189

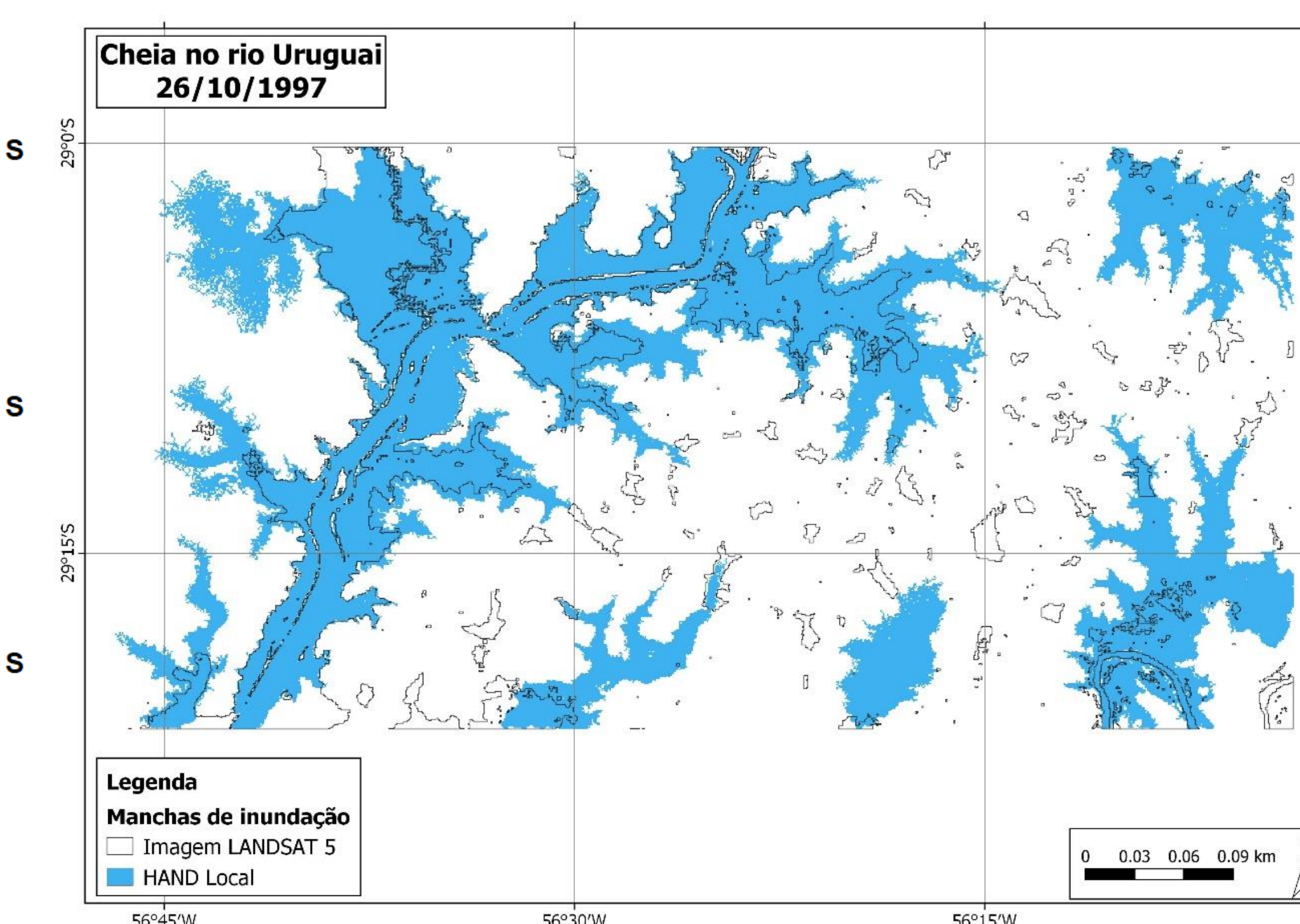


Fig 6. Local HAND based flood map.

$$Fit\ Metric = \frac{N_{sim} \cap N_{obs}}{N_{sim} \cup N_{obs}}$$

Locally relevant model: Fit Metric > 0,65 (Fleischmann et al. (2019), JoHX)