Supplementary Material for
Potential Groundwater Contribution to Amazon Evapotranspiration

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Compiling Water Table Observations

We searched for water table observations over South America to examine the water table depth (WTD) and to validate model simulations. Observations are compiled from government archives and published literature. We searched the government database of each country in S. America and each province except for Brazil and Chile. Repeated emails were sent and phone calls were made where no data was found on the government website or the data is incomplete. Tens of articles are also found which reported the water table depth. Data are mostly presented as plots or maps, from which we read the approximate values. These observations are detailed below.

Argentina

Groundwater information is collected by water companies associated with the provinces or municipalities in different ways and using different quality control standards. There is no centralized database at the national or provincial level. Email was sent to provinces requesting data (list: http://www.hidricosargentina.gov.ar/sitios-organismos.html) with no response. Further search of province websites yielded data from La Pampa, La Rioja, and Mendoza. In La Pampa, WTD time series exist at 73 wells (see http://www.bdh.lapampa.gov.ar/lapampa/well/list.jsp) with 7 showing water level changes over 200 m in a month, caused by pumping in confined aquifers and hence removed. For La Rioja, water levels at tens of wells are found (http://www.larioja.gov.ar/sda/secundarias/perforaciones.html) but well location is in descriptive terms such as "*4 km al norte de Vinchina sobre banquina der. Ruta a Valle Hermoso*" (*4 km north of Vinchina on the right side of the road to valle Hermoso*) and are therefore not usable. Fourteen published papers are found which gave local water table observations not affected by irrigation or pumping (reference 1-14).

Bolivia

No government data was obtained despite repeated emails. One published article reported observations in the Bolivian Amazon (reference 15).

Brazil

The Brazilian Geological Survey (http://siagas.cprm.gov.br/wellshow/indice.asp?w=800) has been the largest data source with observations at over 33,570 wells in unconfined aquifers. But unfortunately they are concentrated in the developed east and southeast and clustered over large metro regions (Fig. S1). The wells are drilled for groundwater exploitation; groundwater is cleaner and has become a major source

for municipal supply. About 95% of the wells in the dataset are reporting high pumping rates. Fig. S1 shows the principle aquifers and aquifer systems (color patches) and the metro regions in Amazonia situated on and are supplied by these large aquifers. Some of the aquifers in the east have seen regional water table decline of over 20 m in recent years. This poses a problem when we use the pumping-affected observations to validate model simulation of natural hydrologic conditions, as discussed in detail later. Fourteen published papers are also found with water table observations (reference 15, 16-28).

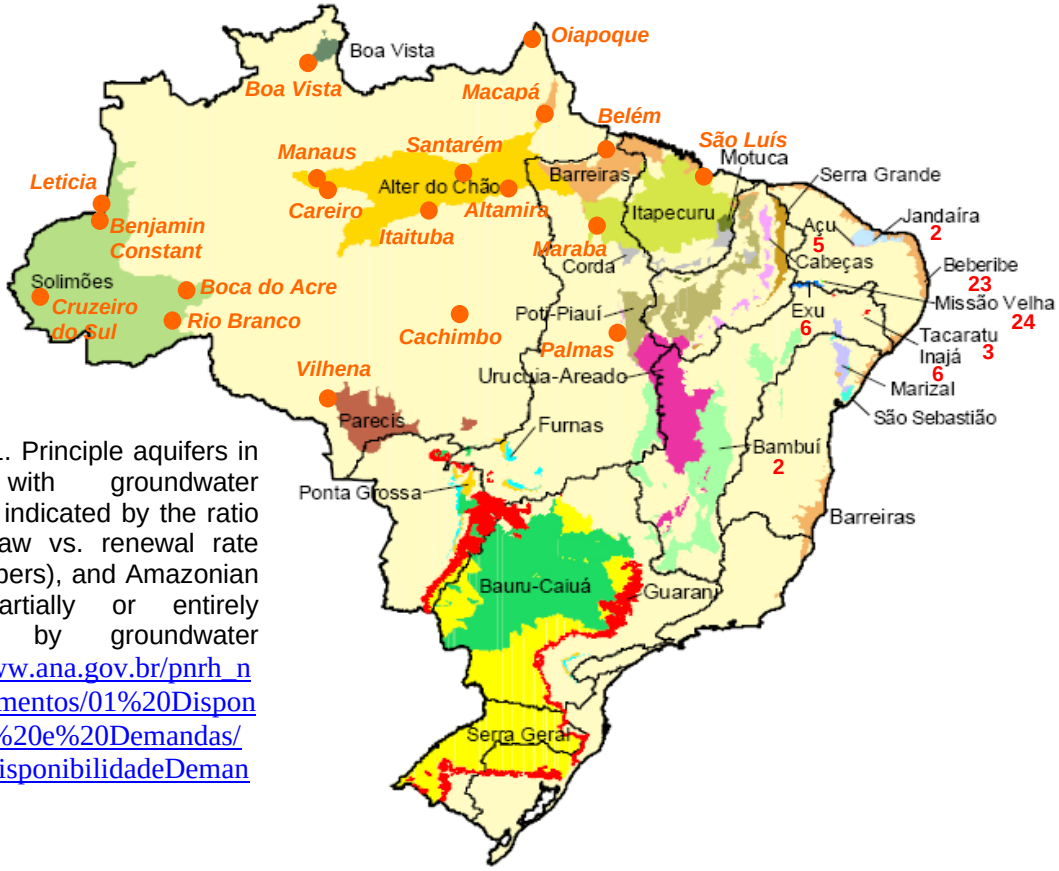

Figure S1. Principle aquifers in Brazil with groundwater depletion indicated by the ratio of withdraw vs. renewal rate (red numbers), and Amazonian cities partially or entirely supplied by groundwater (http://www.ana.gov.br/pnrh_novo/documentos/01%20Disponibilidade%20e%20Demandas/VF%20DisponibilidadeDemanda.pdf).

Chile

WTD time series over 9 years are found for 30 wells maintained by Chilean Direccion General de Aguas (http://www.dga.cl/index.php?option=content&task=category&sectionid=16&id=43&Itemid=169), with one published paper found with observations (reference 29).

Colombia

Repeated email requests were made. One publication has 1 observation in the country (reference 15).

Ecuador

The Instituto Nacional de Meteorología e Hidrologia of Ecuador provides an inventory list of 3,589 wells and springs (http://www.inamhi.gov.ec/html/inicio.htm) but actual water level is published for the Rio Mira basin only (146 sites). Observations at 5 sites are reported in a published literature (reference 15).

Peru

The Insituto Nacional de Recursos Naturales of Peru provides reports of hydrogeologic investigation (17 reports at http://www.inrena.gob.pe/irh/irh_est_hidrogeologicos.htm, and 29 reports at http://www.inrena.gob.pe/irh/irh_proy_asubterraneas_act.htm) but they do not give information on the location of the thousands of wells, except for the valley of Ica which has a separate inventory report (bottom of http://www.inrena.gob.pe/irh/irh_proy_asubterraneas.htm) yielding 66 site observations. We emailed and telephoned the contact given on the website and were assured many months ago that an expert will get back to us. The report of Iquitos includes a map of the wells, which is gridded into 128 cells of 300m by 300m and the mean in each cell is averaged. The report of Motupe includes a map of cities after which groundwater zones are named and water table range given, yielding 13 points. The same method is used to obtain 16 points from the La Leche report and 2 points from the Pucallpa report. Observations at 4 sites in the Peruvian Amazon are found in one published literature (reference 15).

Suriname

A Ph.D. thesis provided detailed studies of the rainforest climate, geology, hydrology and ecology (reference 30).

Venezuela

No government data were found despite phone calls and emails. Two published journal articles are found with study sites in southern Venezuela (reference 31-32).

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