SERVIÇO GEOLÓGICO DO BRASIL

3ª Reunião de Avaliação das Condições Hidrometeorológicas da Região Norte

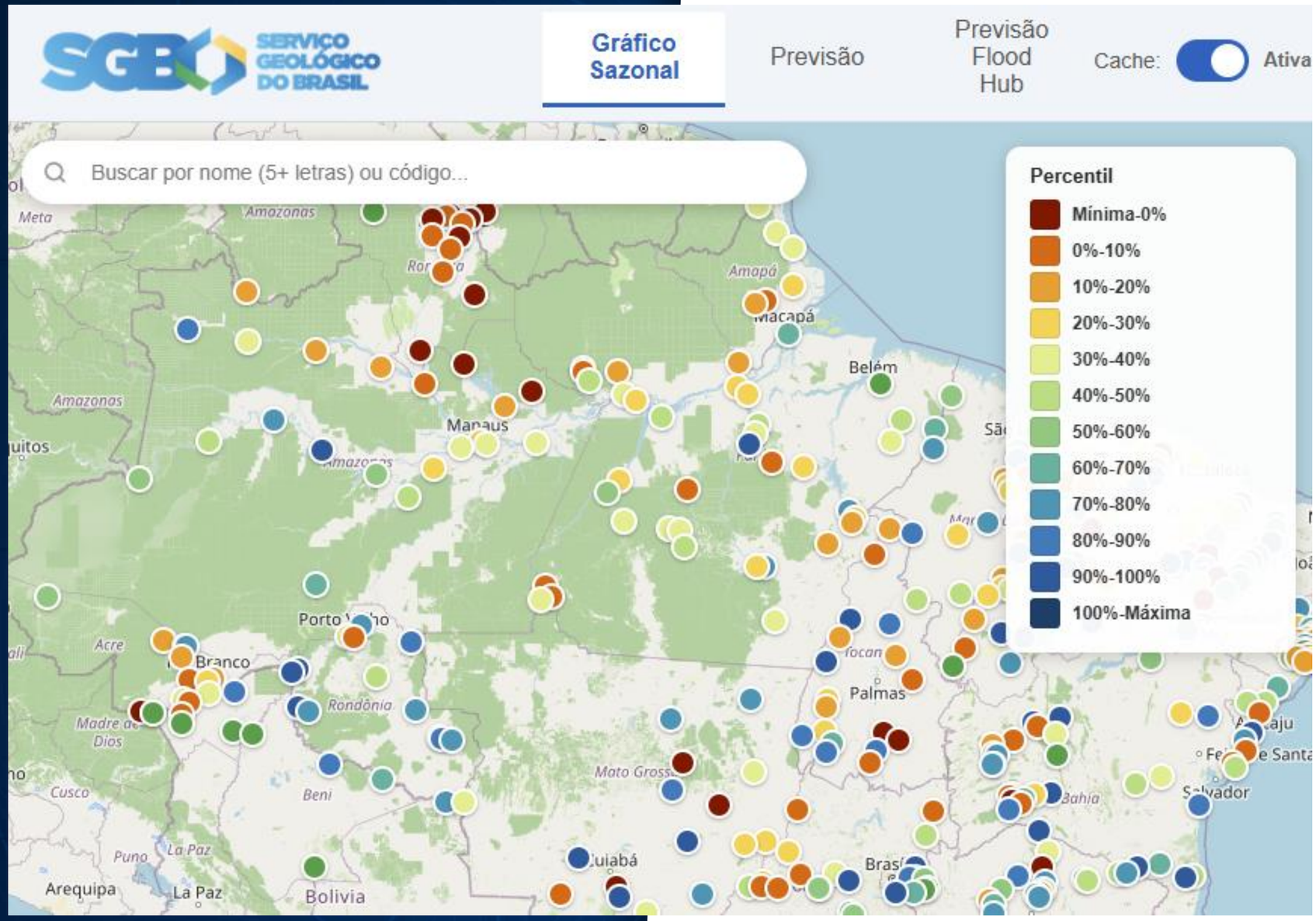
MARCUS SUASSUNA SANTOS
Pesquisador em Geociências – SGB/CPRM

25 de setembro de 2026

CONDIÇÃO ATUAL

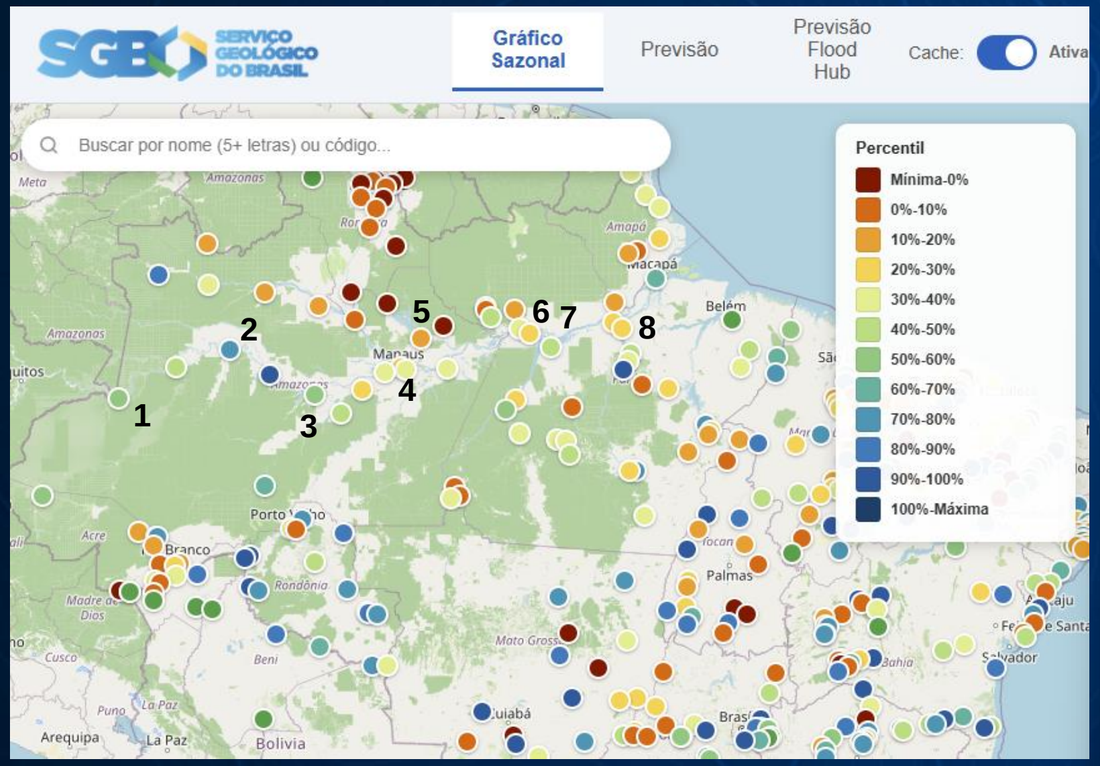
SERVIÇO GEOLÓGICO DO BRASIL

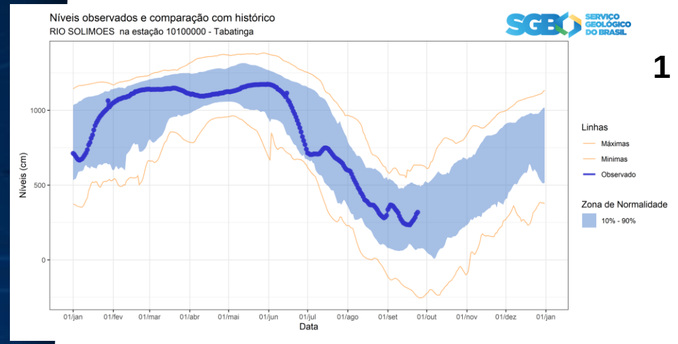
BACIA AMAZÔNICA



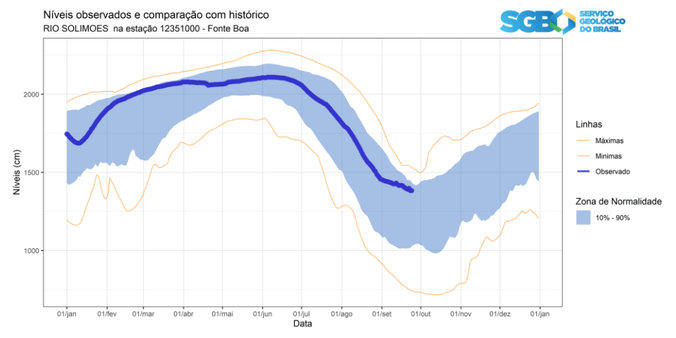
BACIA AMAZÔNIA

Rio Branco / Negro
Significativas anomalias negativas de chuvas e níveis dos rios
Rio Madeira
Predominância de anomalias positivas
Alto Solimões
Subidas em Tabatinga

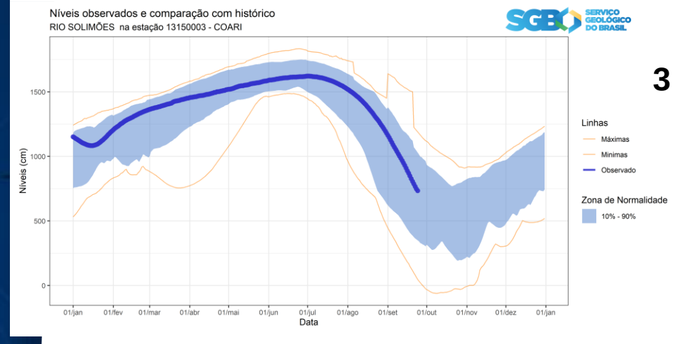




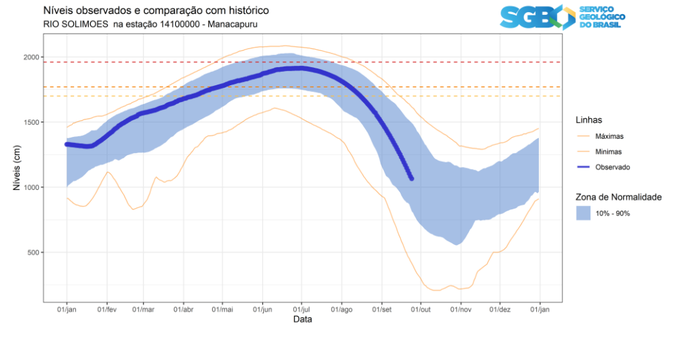
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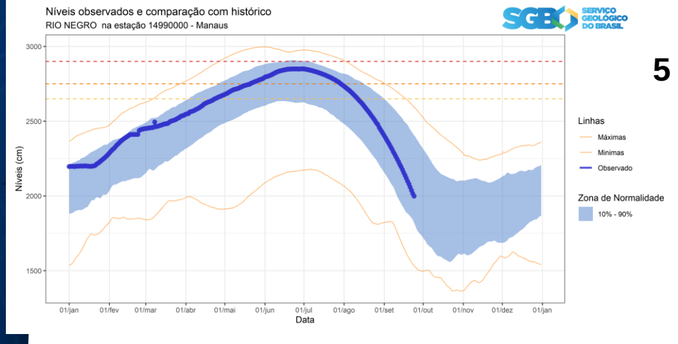
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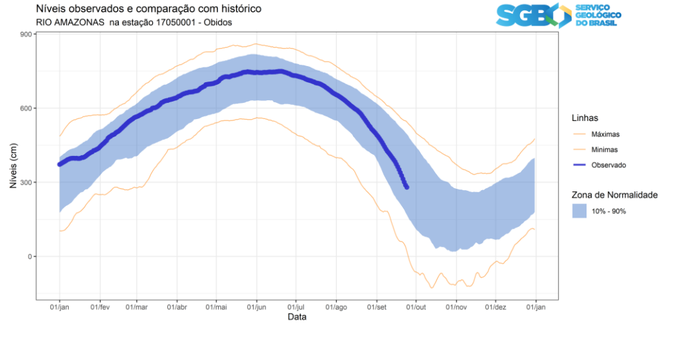
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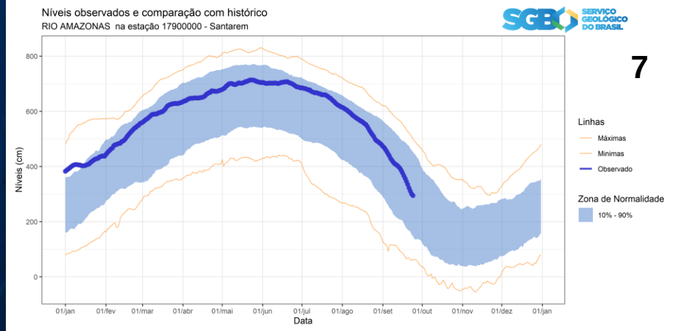
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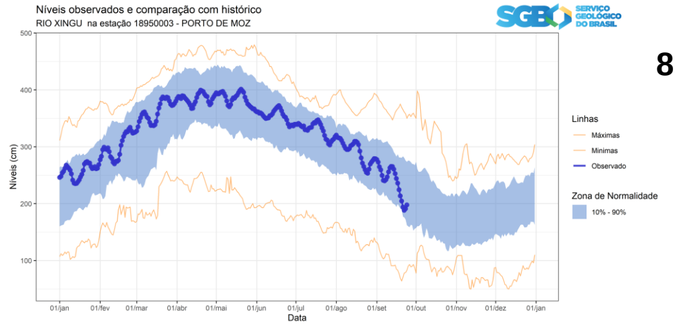
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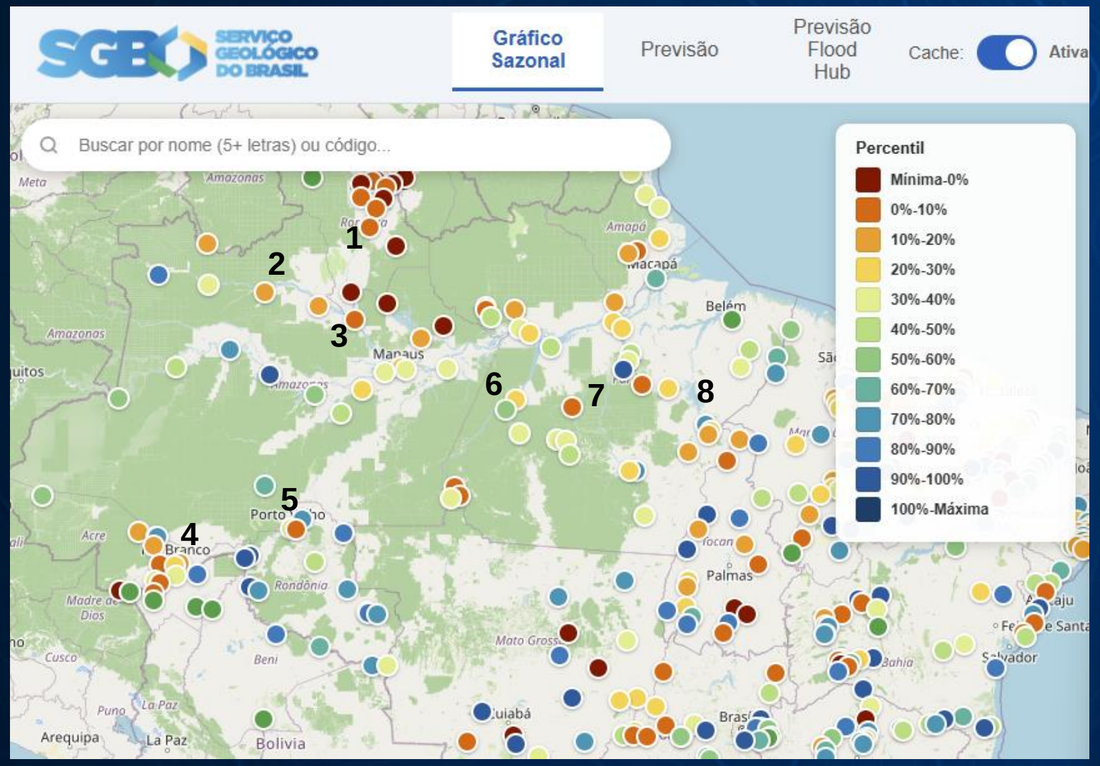
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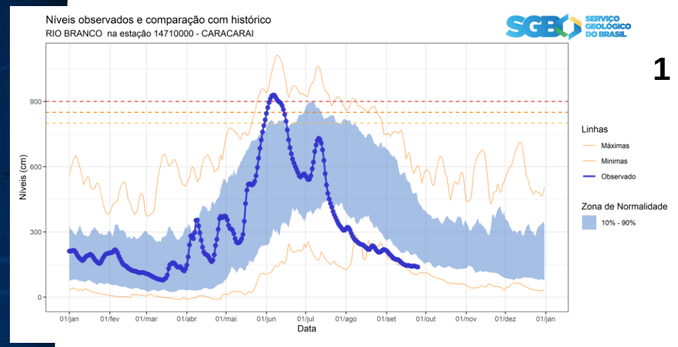


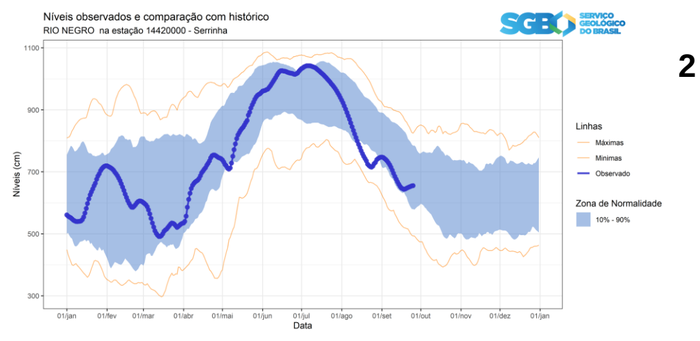
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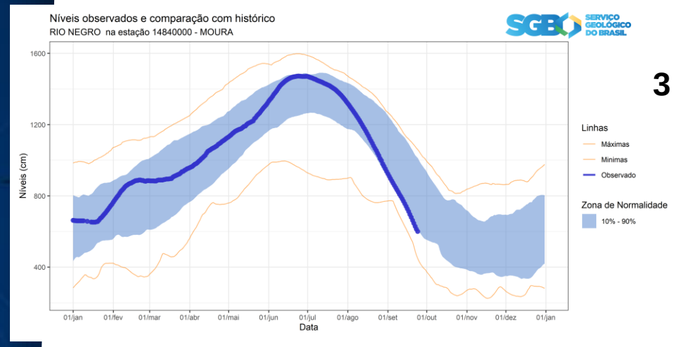
BACIA AMAZÔNIA

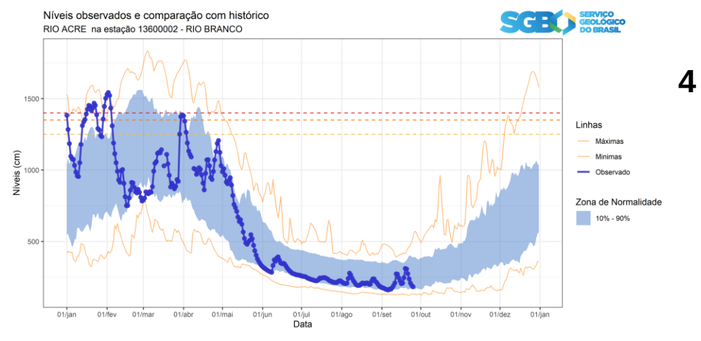
Rio Branco / Negro
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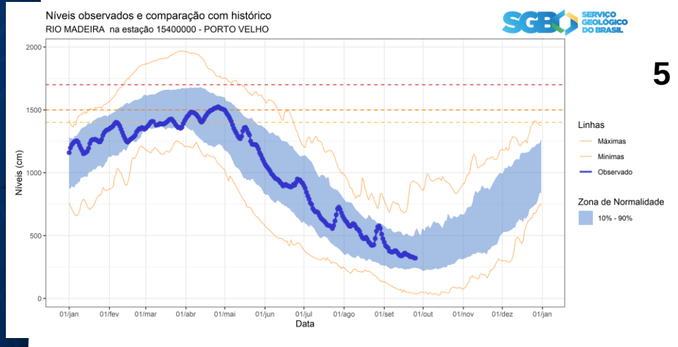


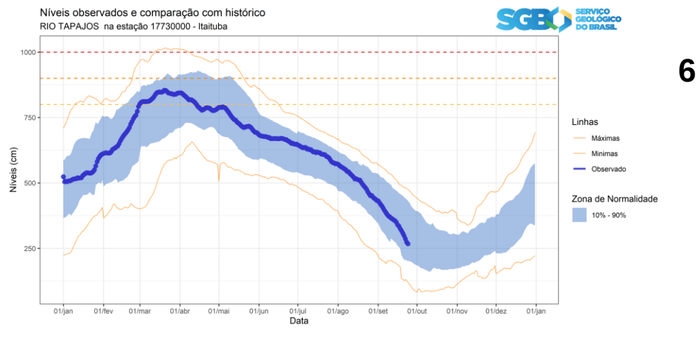


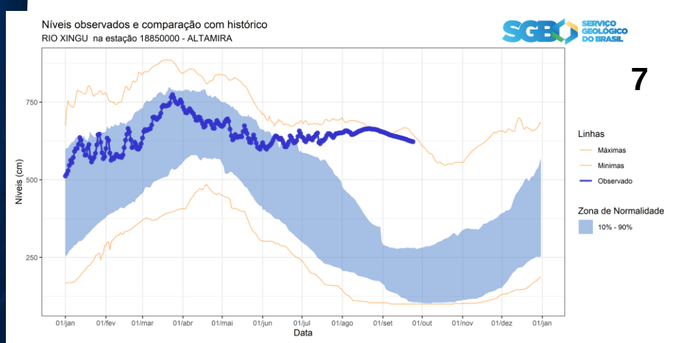


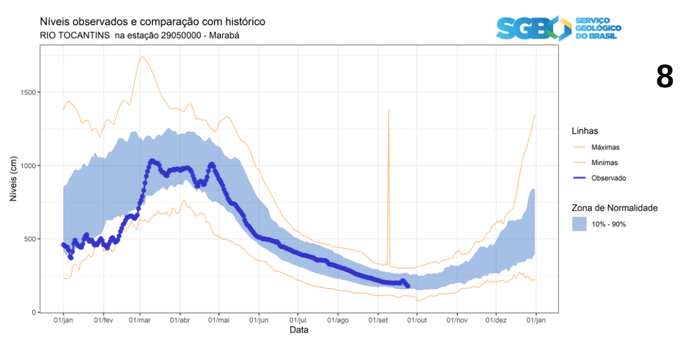








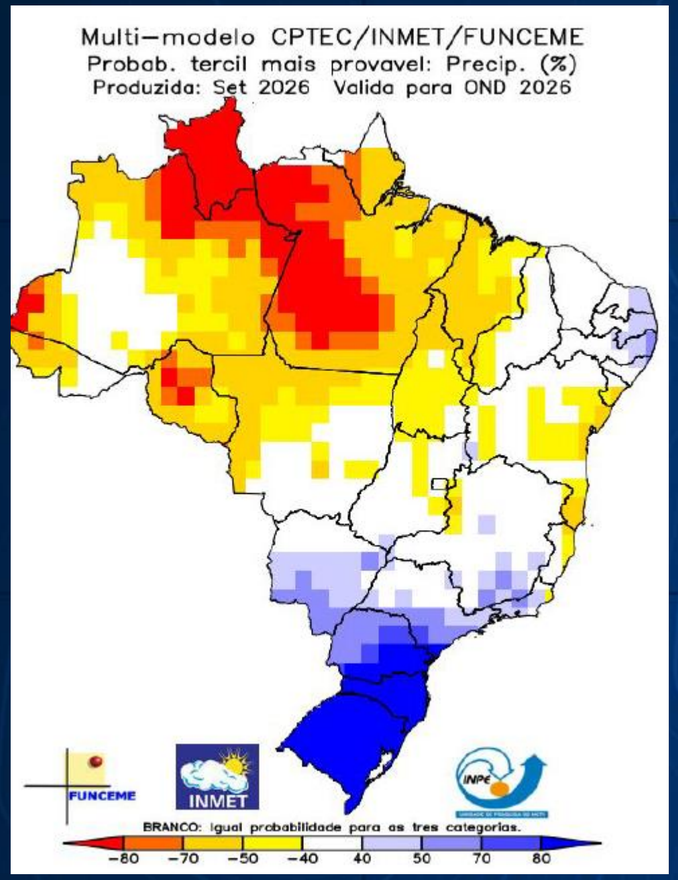




PREVISÕES CLIMÁTICAS SAZONAIS

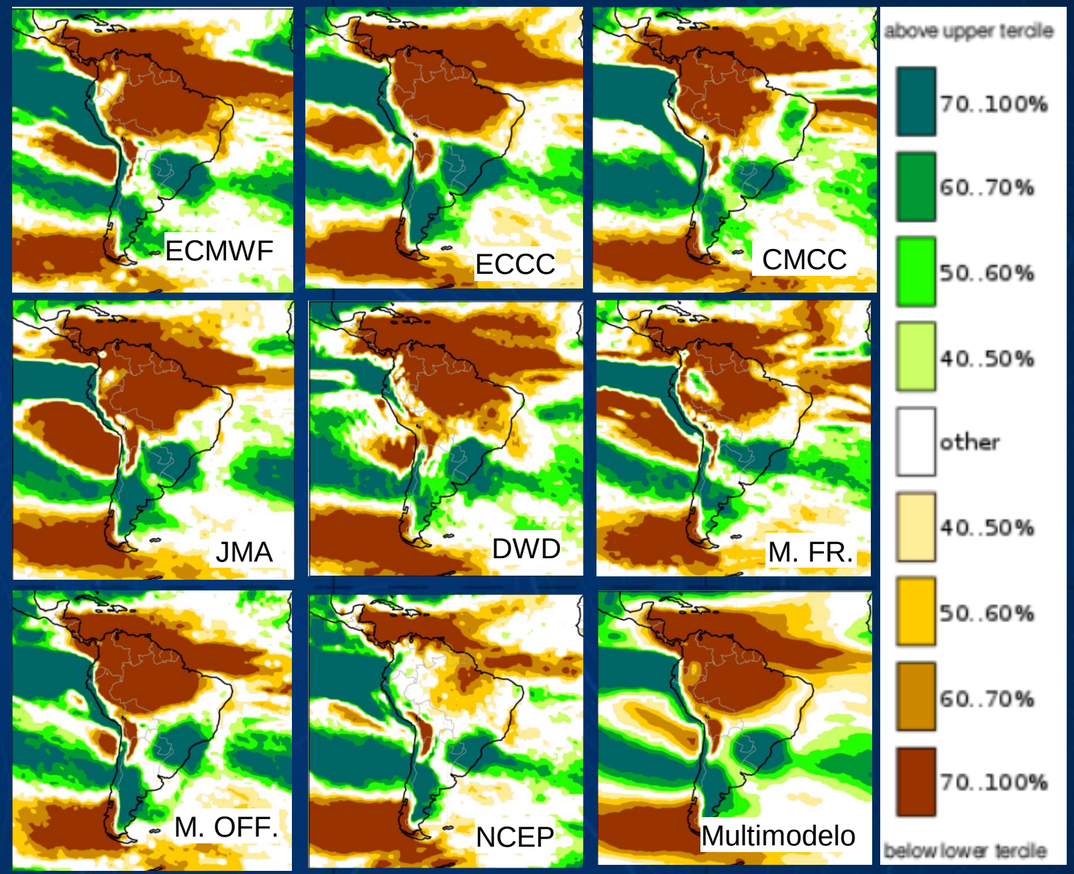
SERVIÇO GEOLÓGICO DO BRASIL

PROGNÓSTICOS SAZONAIS DE CHUVAS (prox. 3 meses)



(FONTE: CPTEC/INPE)

https://clima.cptec.inpe.br/



(FONTE: Climate Change Service/Copernicus)

https://climate.copernicus.eu/charts/

Atualizado em 21/09/2026

PROGNÓSTICOS HIDROLÓGICOS

SERVIÇO GEOLÓGICO DO BRASIL

MONITORAMENTO SGB/CPRM 2026

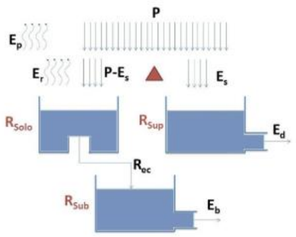
IA (SGB/UFSC) - MODELOS UTILIZADOS

Testes operacionais

SISTEMA DE ALERTA E MONITORAMENTO HIDROLÓGICO DE BACIAS NA AMAZÔNIA

LabHidro SGB

Estrutura do SMAP



Método dos Anos Análogos

A previsão é construída diariamente utilizando o valor observado no último dia disponível antes da data de previsão.

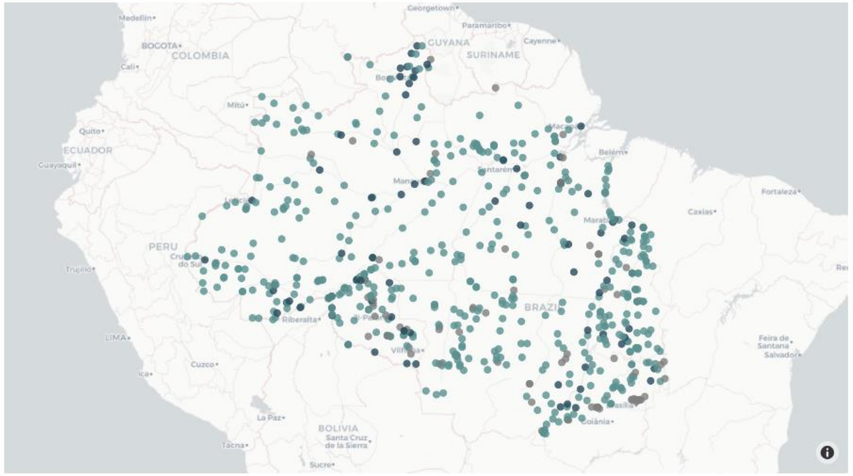
Inicialmente é identificado o dia do ano correspondente à última observação disponível. Em seguida, são selecionados todos os anos históricos que possuem observação para o mesmo dia do ano. Para cada ano histórico é calculada a diferença absoluta entre a cota observada no dia da previsão e a cota observada no mesmo dia daquele ano. Os anos são ordenados e selecionados os dez anos mais semelhantes (dez análogos).

Para cada horizonte de previsão são calculadas estatísticas descritivas entre os dez análogos selecionados:

```
mediana;
valor mínimo;
valor máximo;
percentis de 10% e 90%.
```

A mediana foi adotada como previsão determinística do modelo, enquanto os percentis representam a incerteza associada à previsão.

- Previsão de Cota: **76**
- Previsão de Vazão: **580**
- Ambos: **76**
- Sem previsão: **74**



Algoritmo do Random Forest

O Random Forest é um método baseado em múltiplas árvores de decisão construídas a partir de diferentes amostras dos dados hidrológicos. Cada árvore realiza particionamentos sucessivos nas variáveis de entrada, permitindo representar relações não lineares entre variáveis meteorológicas e vazão. O método possui seleção automática de variáveis. Além de serem facilmente interpretáveis, árvores têm a vantagem de lidar trivialmente com covariáveis discretas.

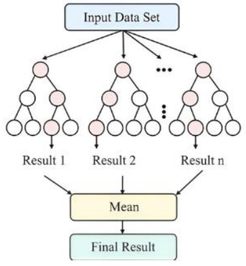


Fig. 2 Fonte: Liang et al., 2023

Algoritmos dos modelos

Regressão linear é de baixa complexidade computacional, método estatístico que estabelece relações lineares entre variáveis hidrometeorológicas de entrada e a cota prevista. Nesse sentido foi utilizado modelo de Regressão Linear simples e o modelo de Ridge.

O boosting consiste na agregação de diferentes estimadores da função de regressão. No boosting, o estimador é construído incrementalmente. A cada passo, busca corrigir os erros das previsões anteriores. Existem diferentes implementações e variações de boosting. Um particular que vem ganhando bastante popularidade por seu ótimo desempenho é o XGBoost (Chen e Guestrin, 2016). Uma vantagem das implementações do XGBoost é que ela permite trabalhar com matrizes esparsas e são computacionalmente rápidas.

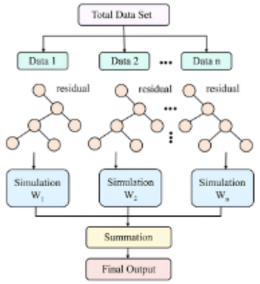


Fig. 3 Fonte: Liang et al., 2023

Por fim, o modelo de redes neurais utilizado foi o MultiLayer Perceptron. Algoritmo composto por múltiplas camadas de neurônios artificiais capazes de aprender relações complexas e não lineares entre variáveis hidrometeorológicas e resposta hidrológica.

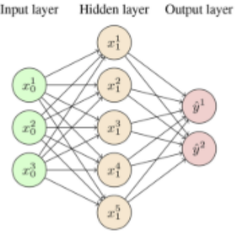


Fig. 4 Fonte: Bentivoglio et al., 2022

↑ Back to top

MONITORAMENTO SGB/CPRM 2026 – MODELO DE ANÁLOGOS

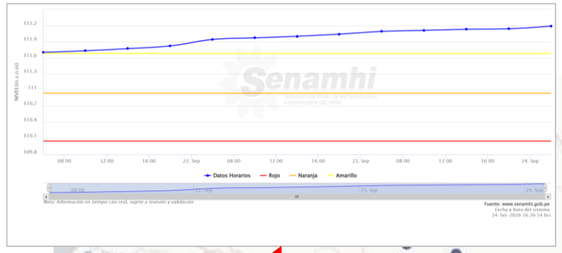
IA (SGB/UFSC)

Testes operacionais

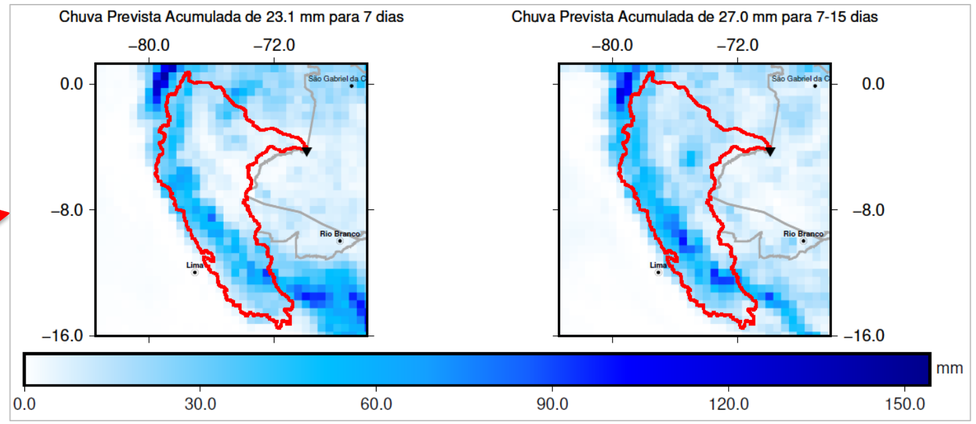
TABATINGA / RIO SOLIMÕES

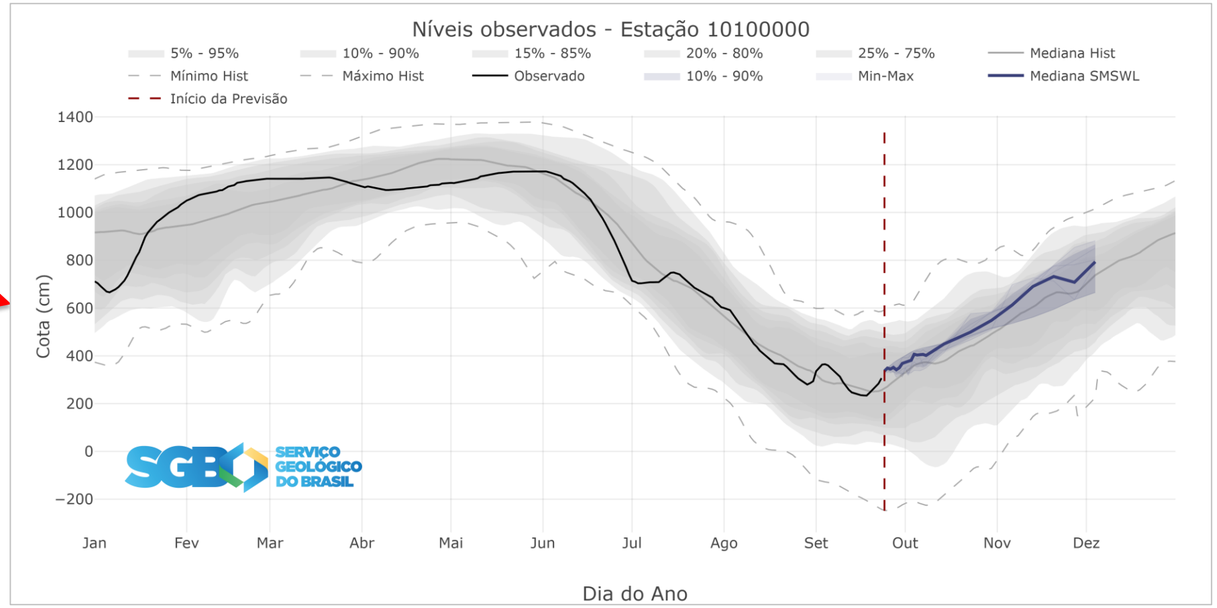
SENAMHI / Peru

TAMSHIYACU



167 estações carregadas





MONITORAMENTO SGB/CPRM 2026 – MODELO DE ANÁLOGOS

IA (SGB/UFSC)

Testes operacionais

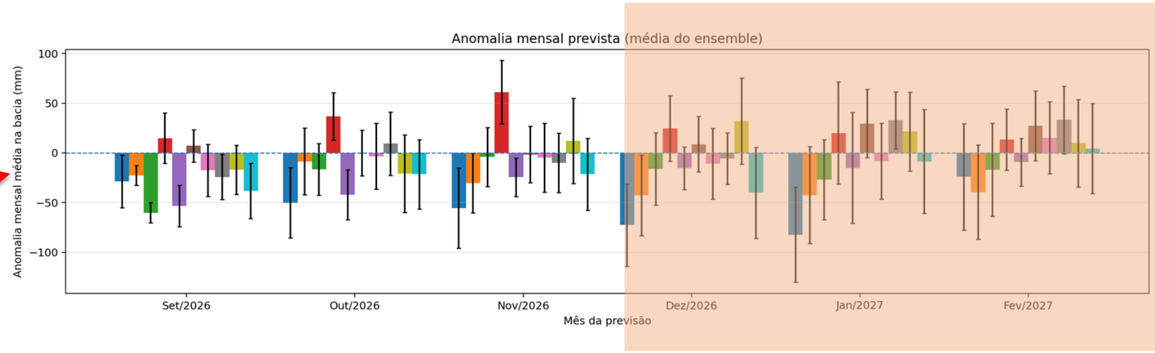
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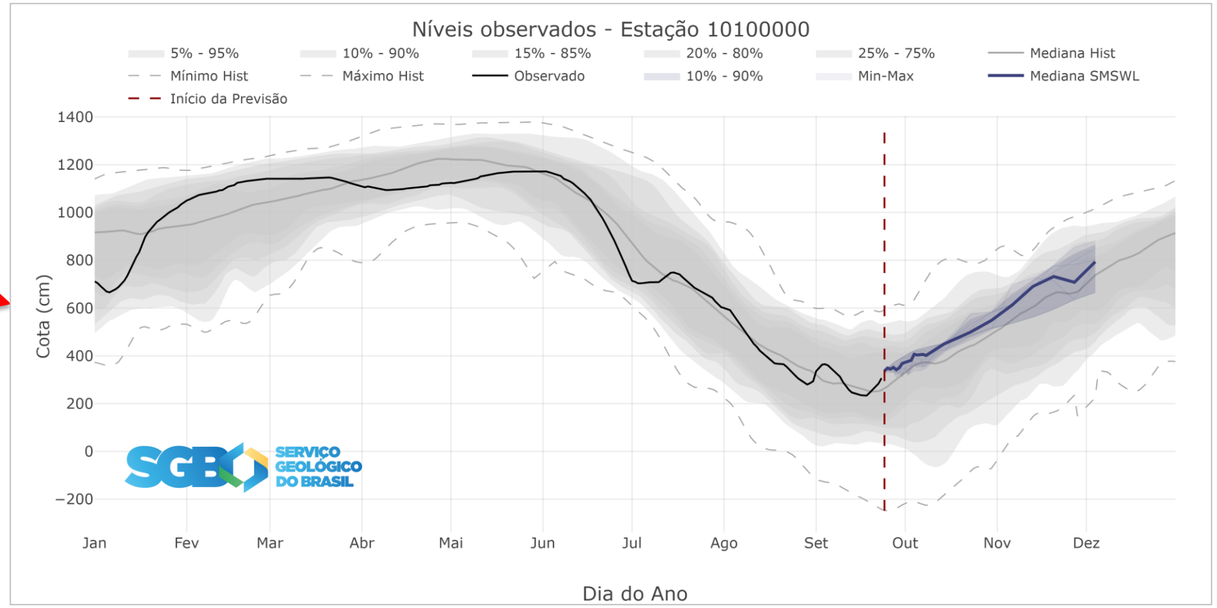
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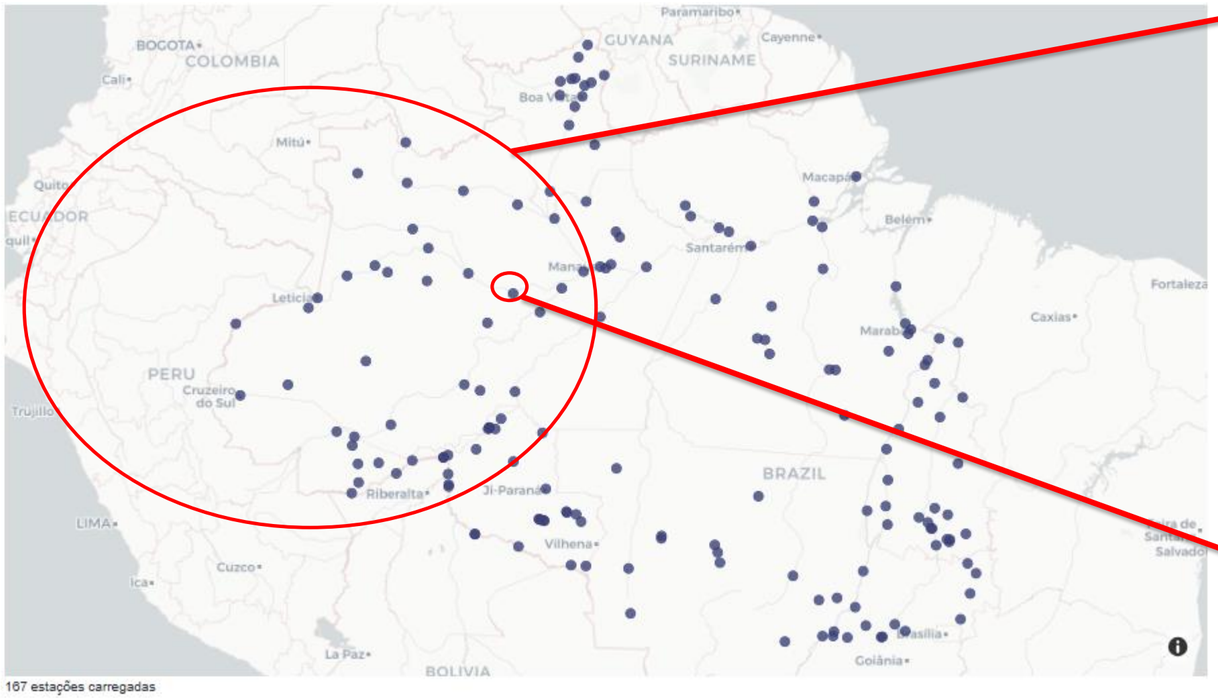


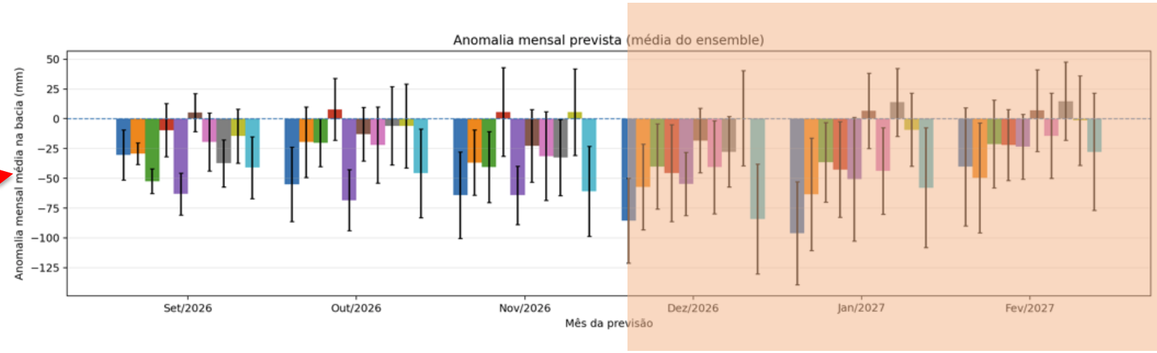
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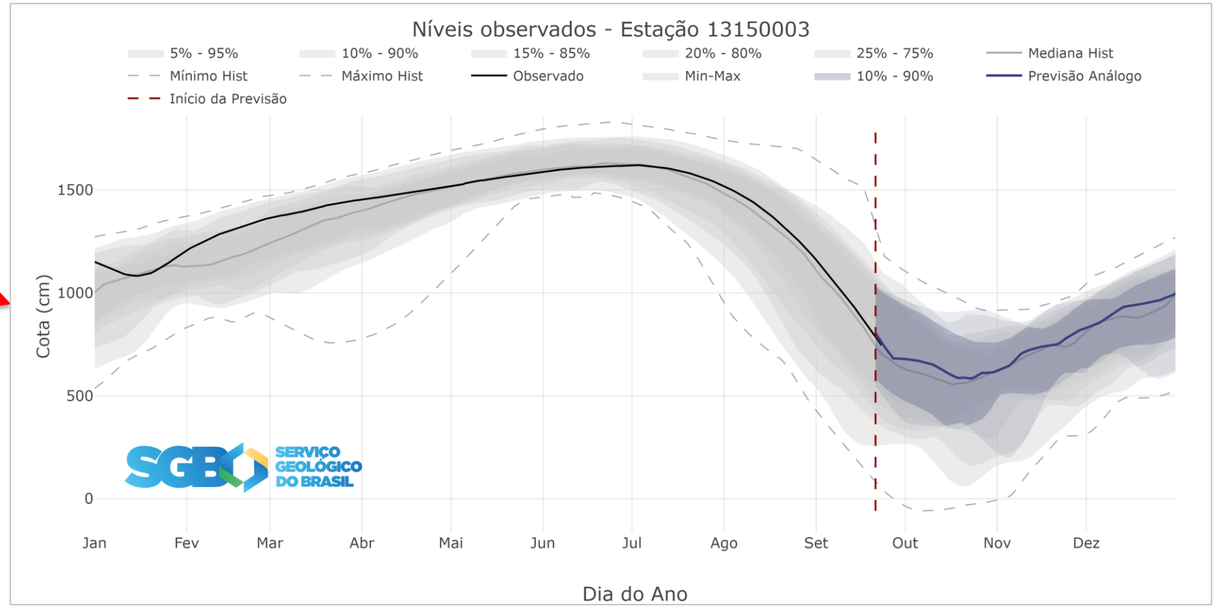
IA (SGB/UFSC)

Testes operacionais

COARI / RIO SOLIMÕES





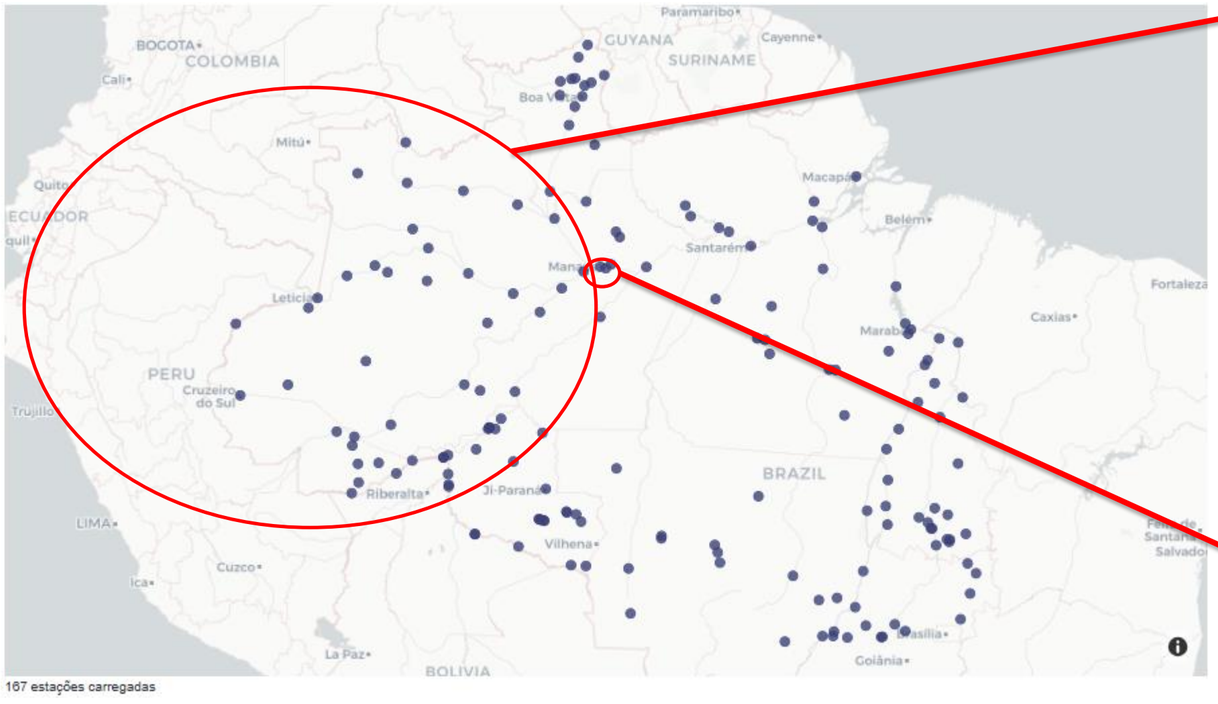


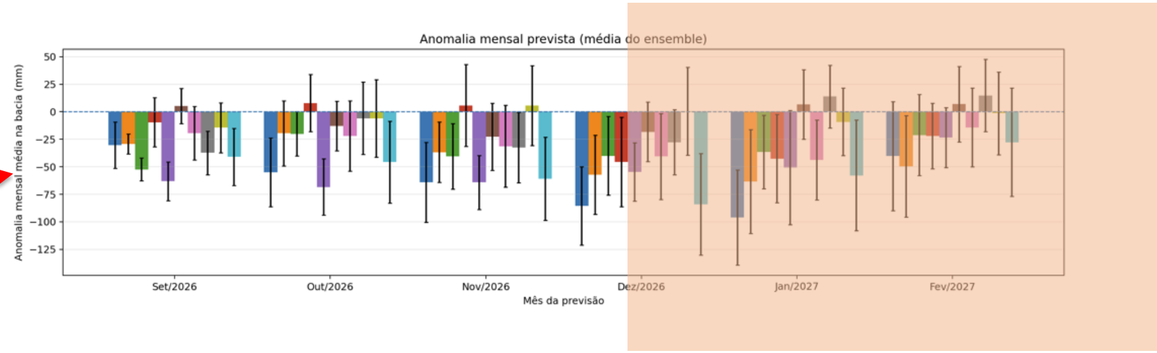
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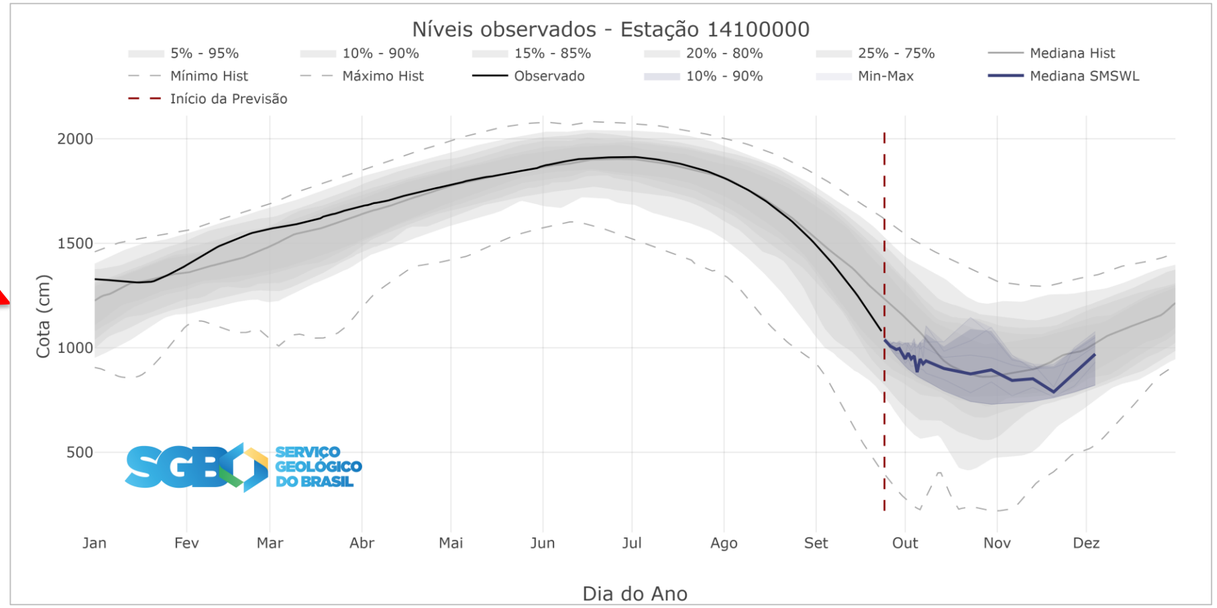
IA (SGB/UFSC)

Testes operacionais

MANACAPURU / RIO SOLIMÕES





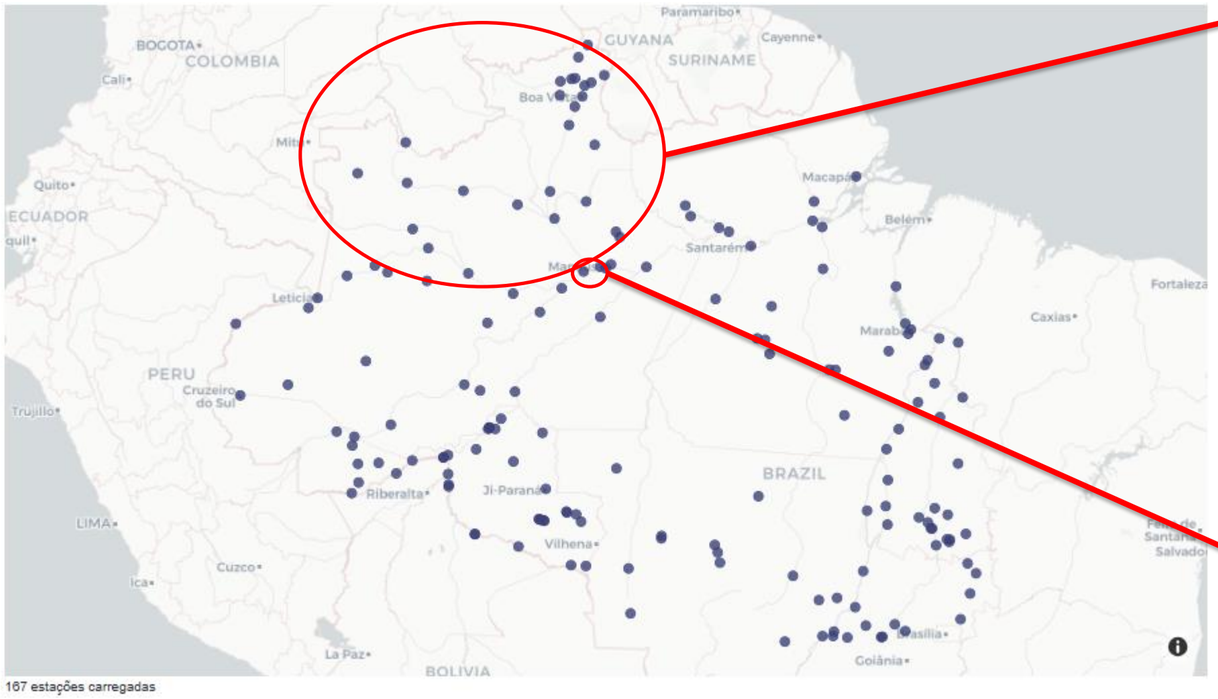


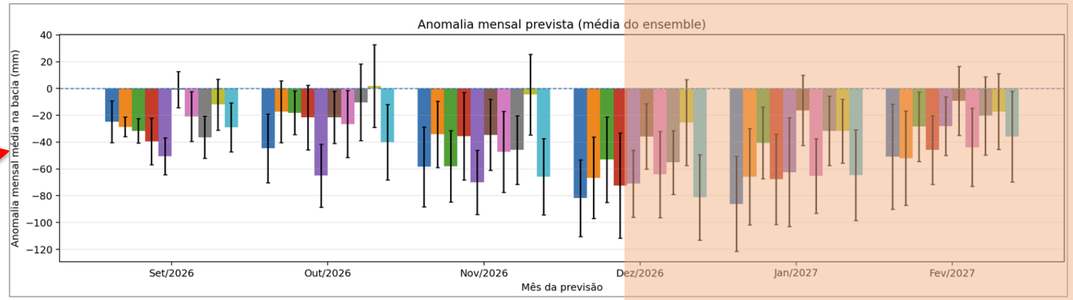
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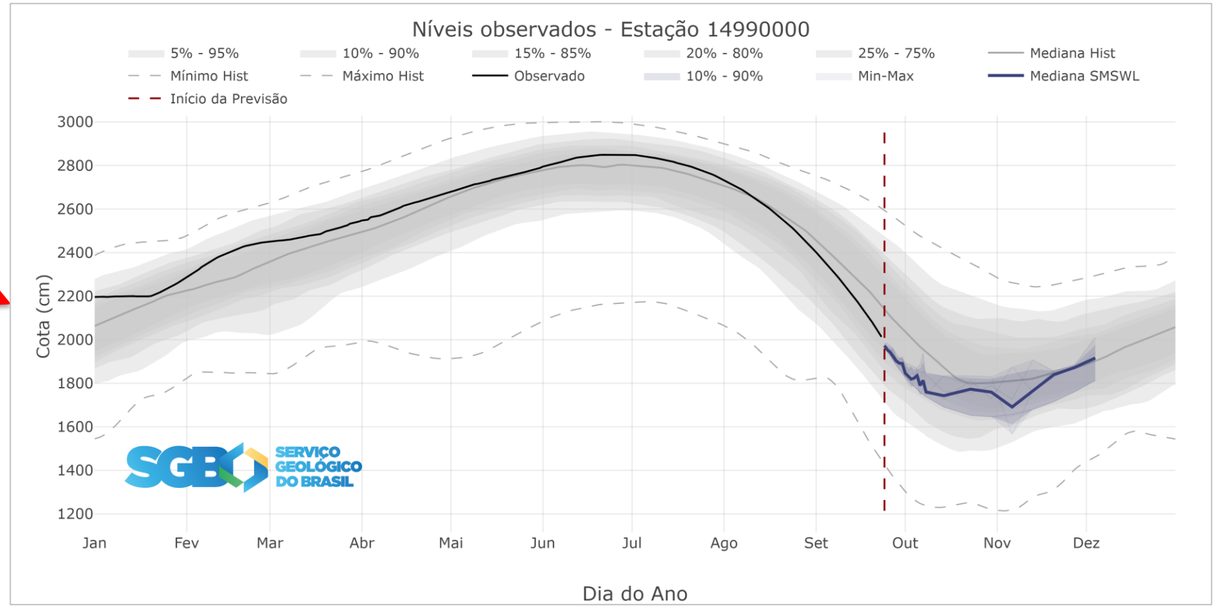
IA (SGB/UFSC)

Testes operacionais

MANAUS / RIO NEGRO





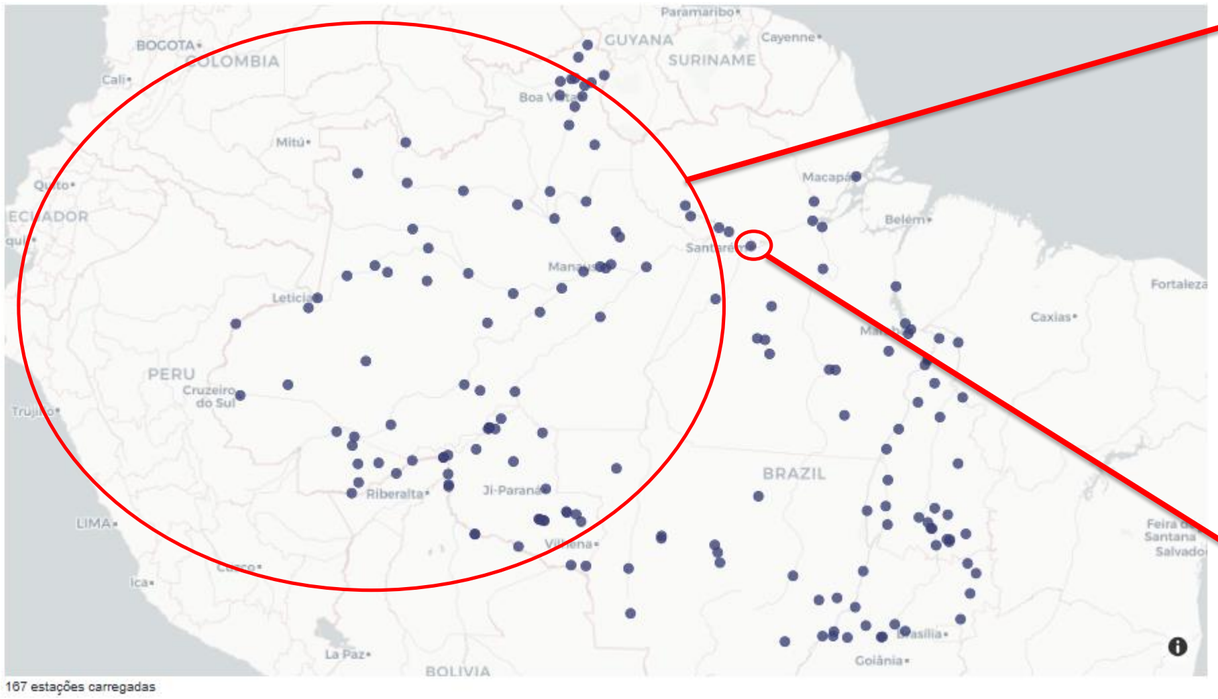


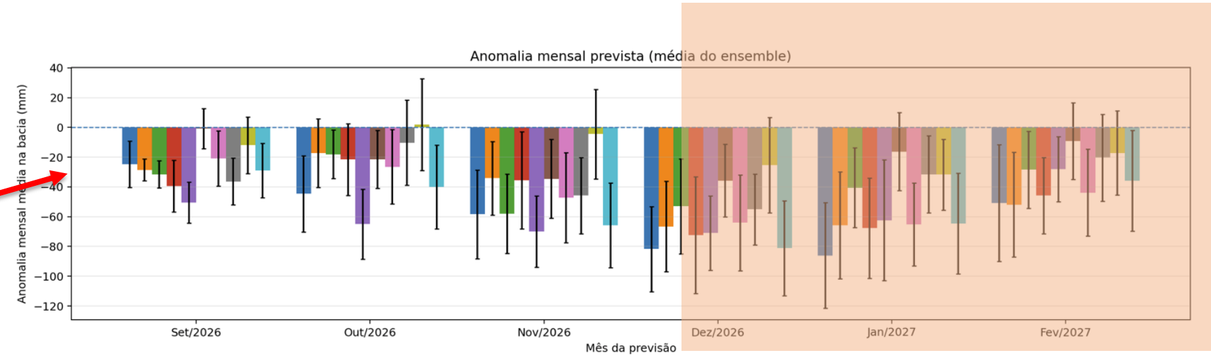
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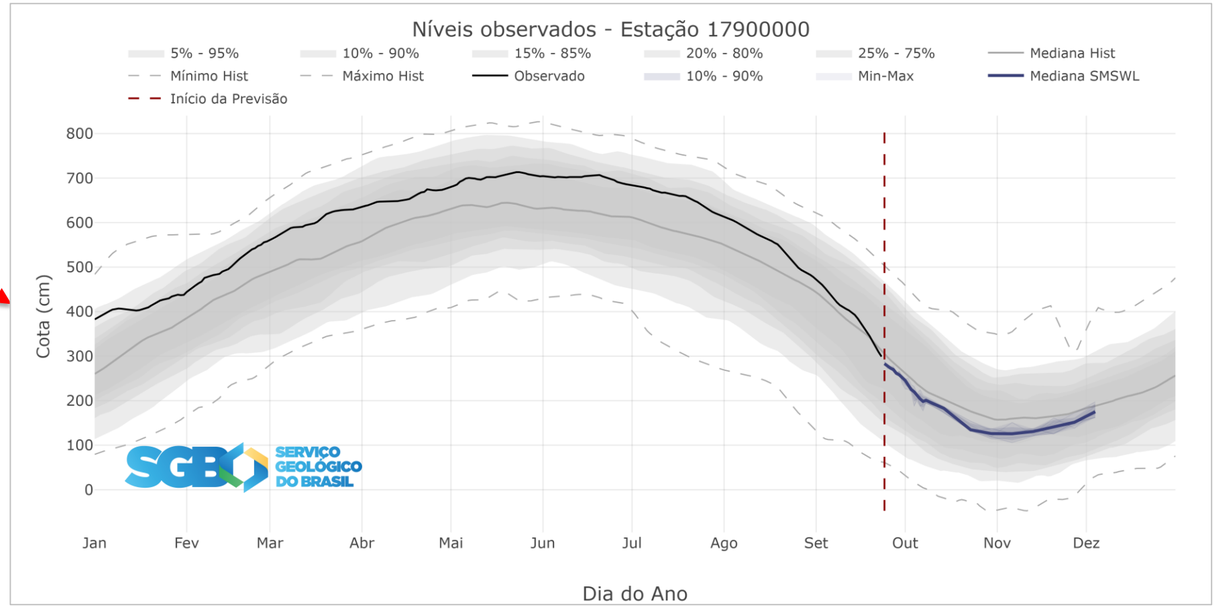
IA (SGB/UFSC)

Testes operacionais

SANTARÉM / RIO AMAZONAS





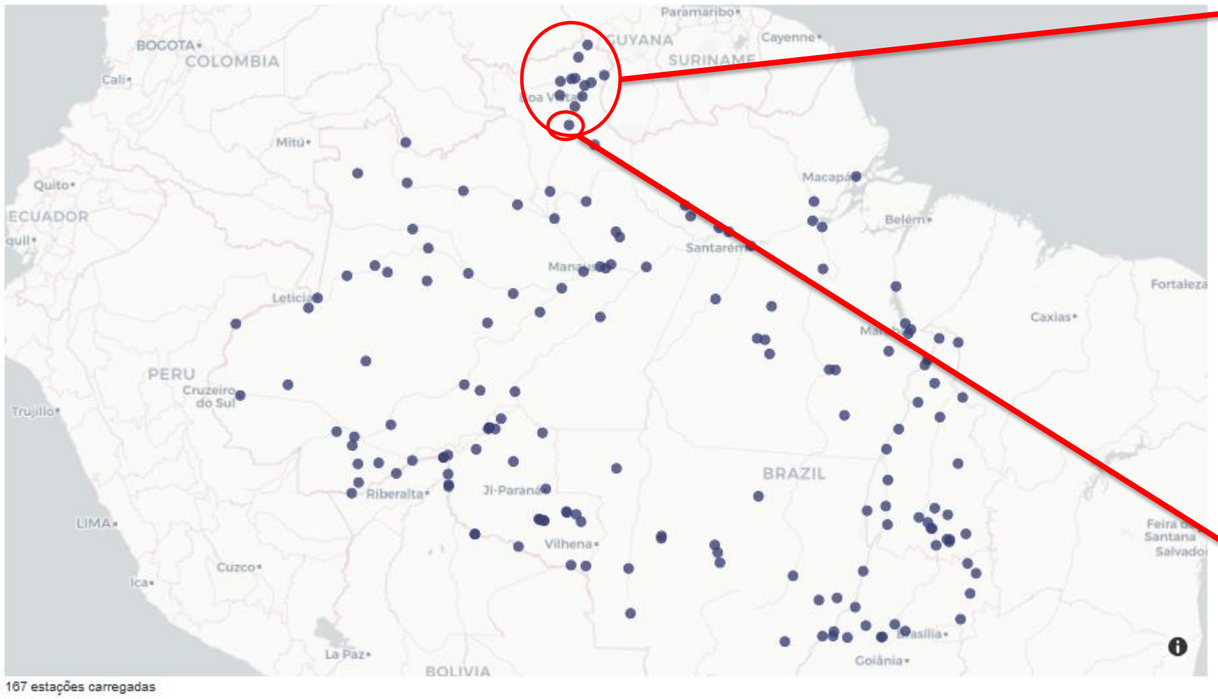


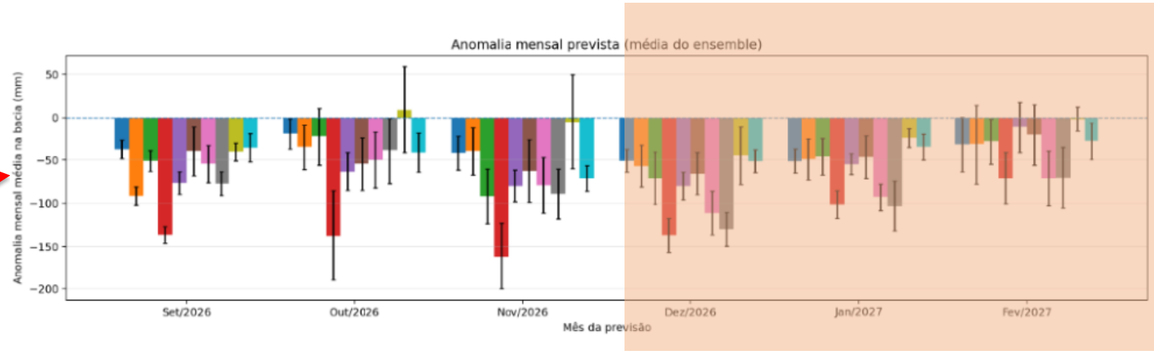
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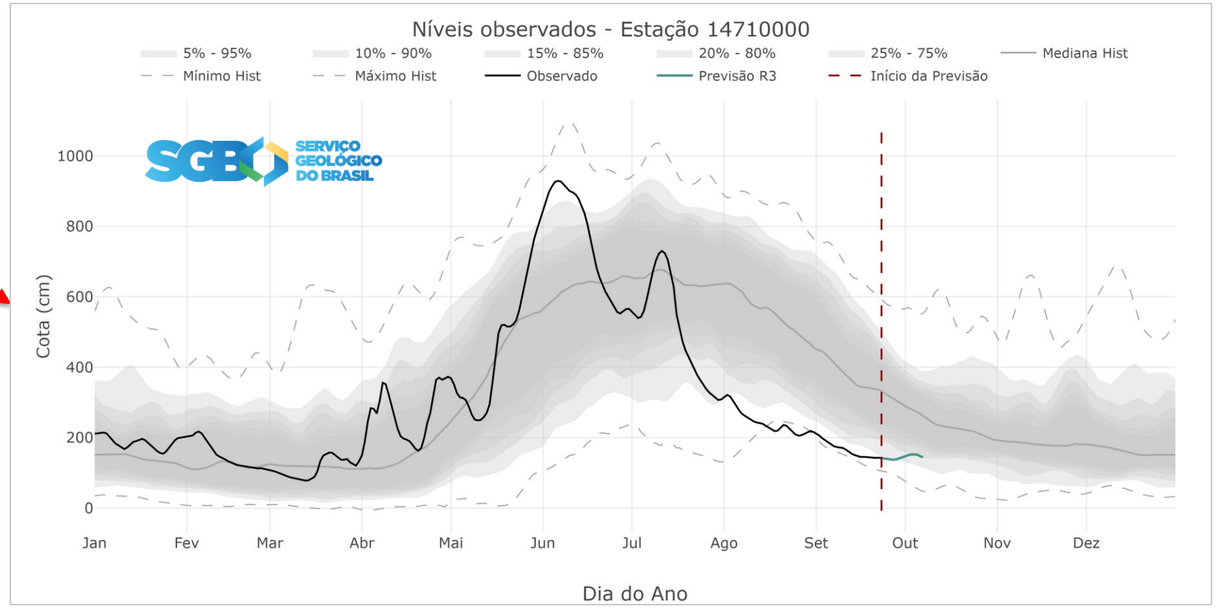
IA (SGB/UFSC)

Testes operacionais

CARACARAÍ / RIO BRANCO





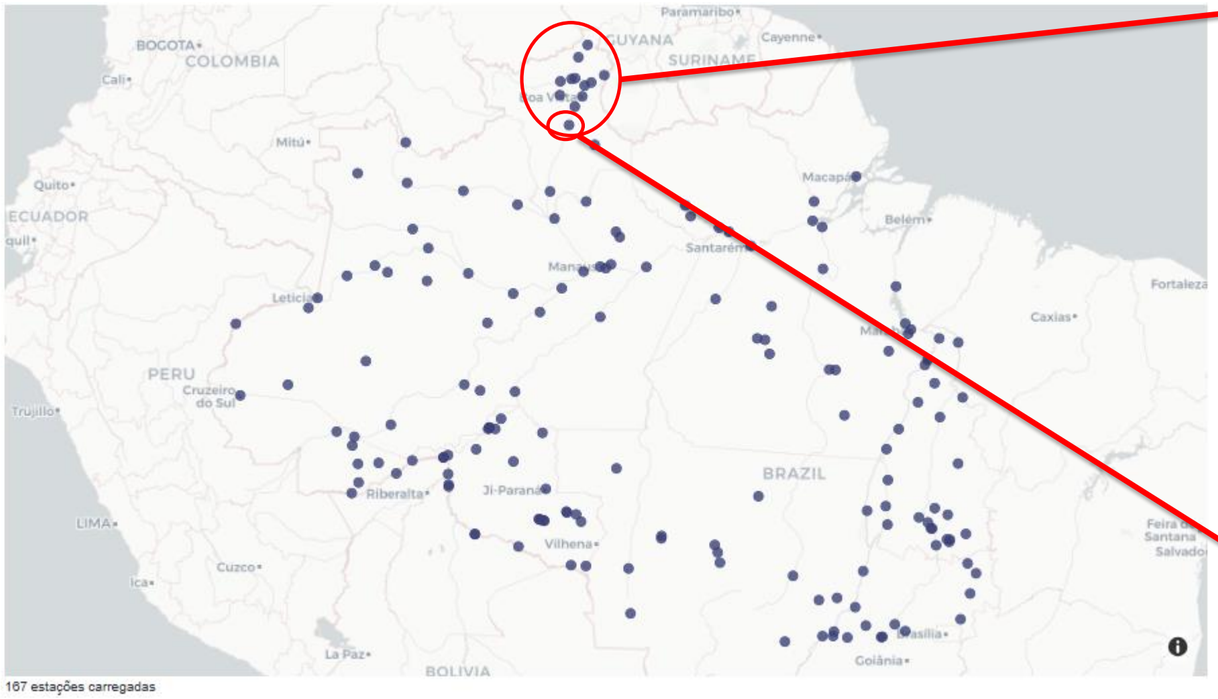


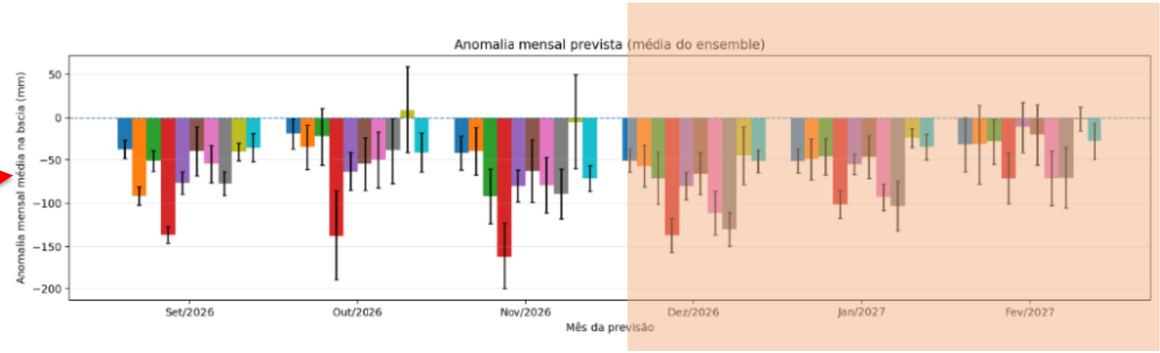
MONITORAMENTO SGB/CPRM 2026 – MODELO DE ANÁLOGOS

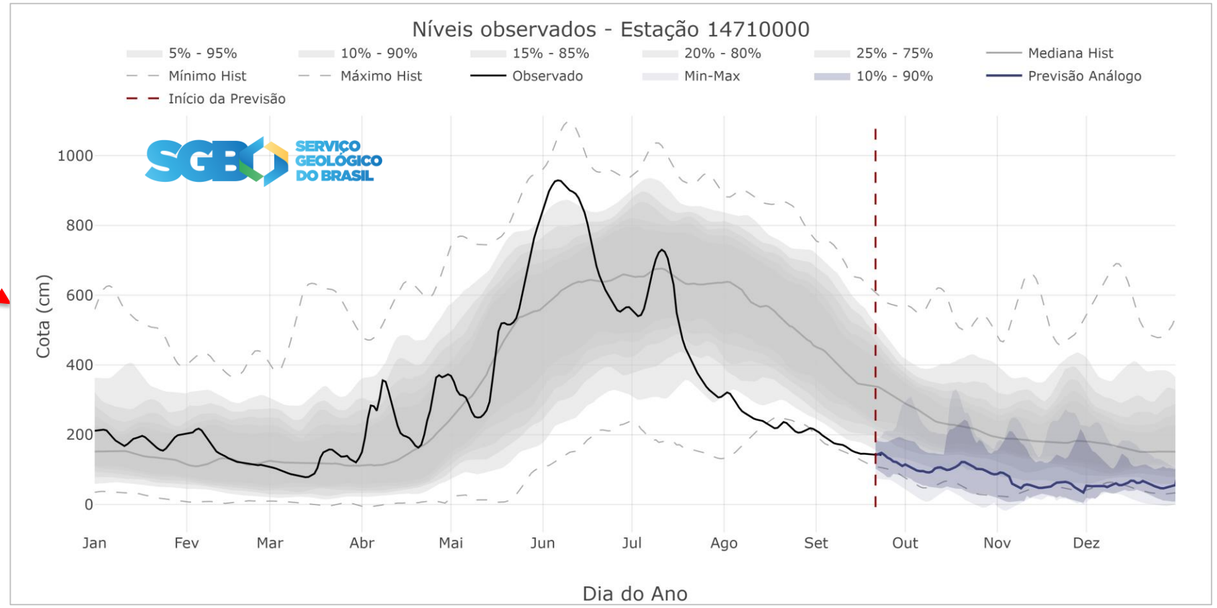
IA (SGB/UFSC)

Testes operacionais

CARACARAÍ / RIO BRANCO





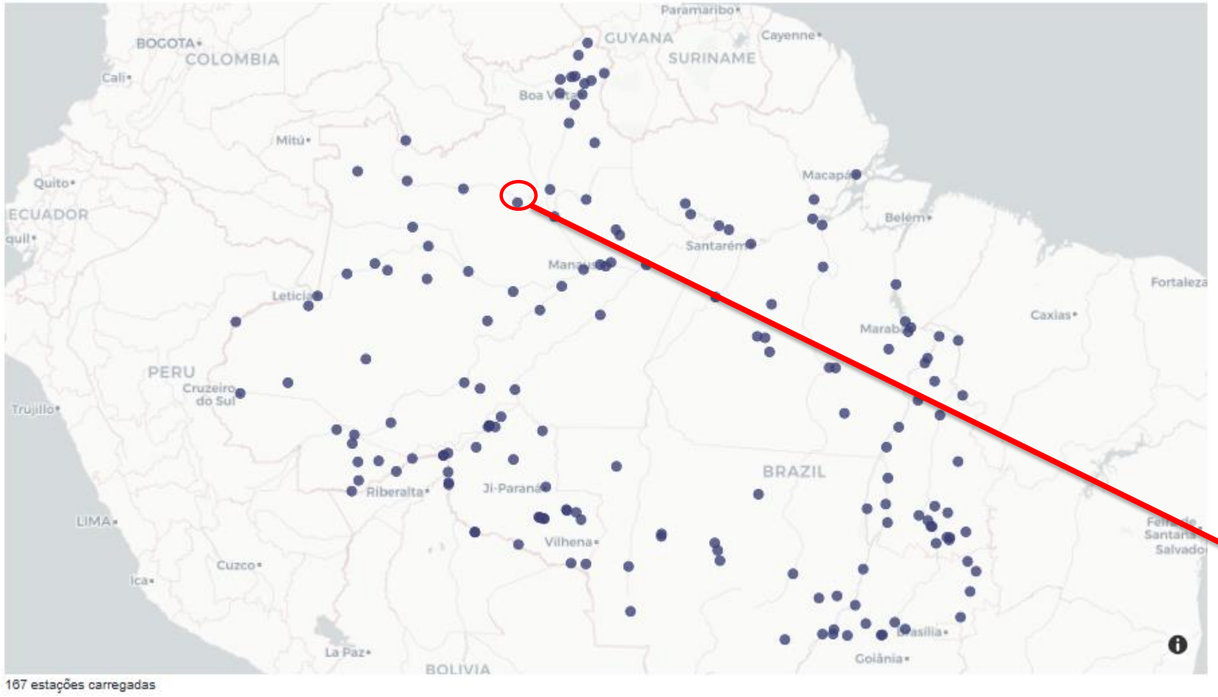


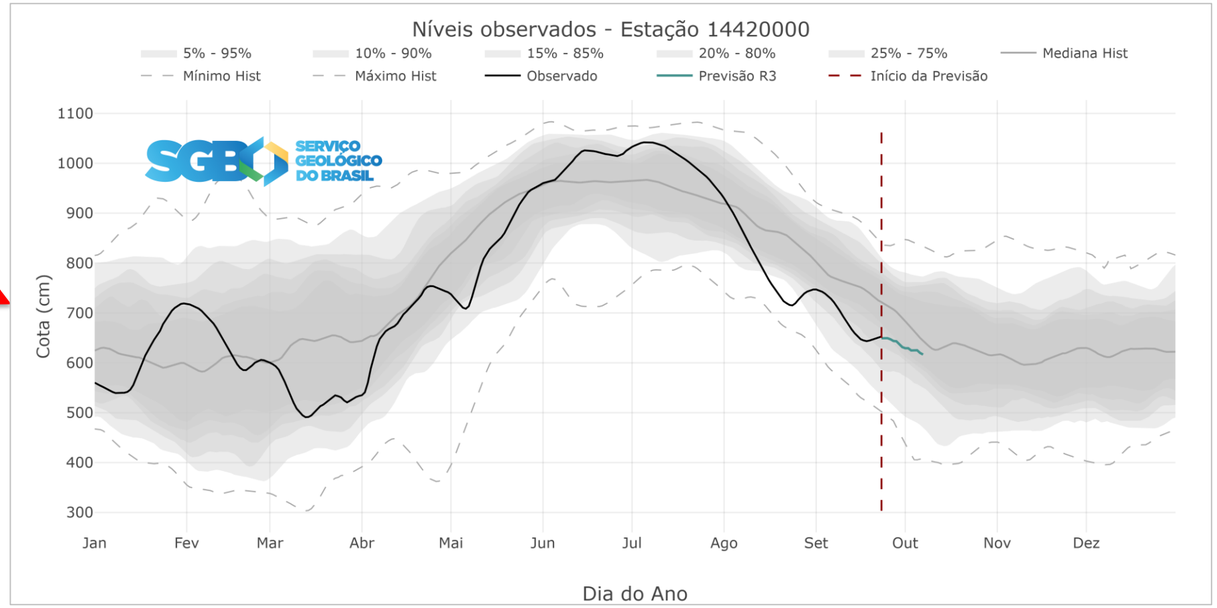
MONITORAMENTO SGB/CPRM 2026 – MODELO DE ANÁLOGOS

IA (SGB/UFSC)

Testes operacionais

SERRINHA / RIO NEGRO



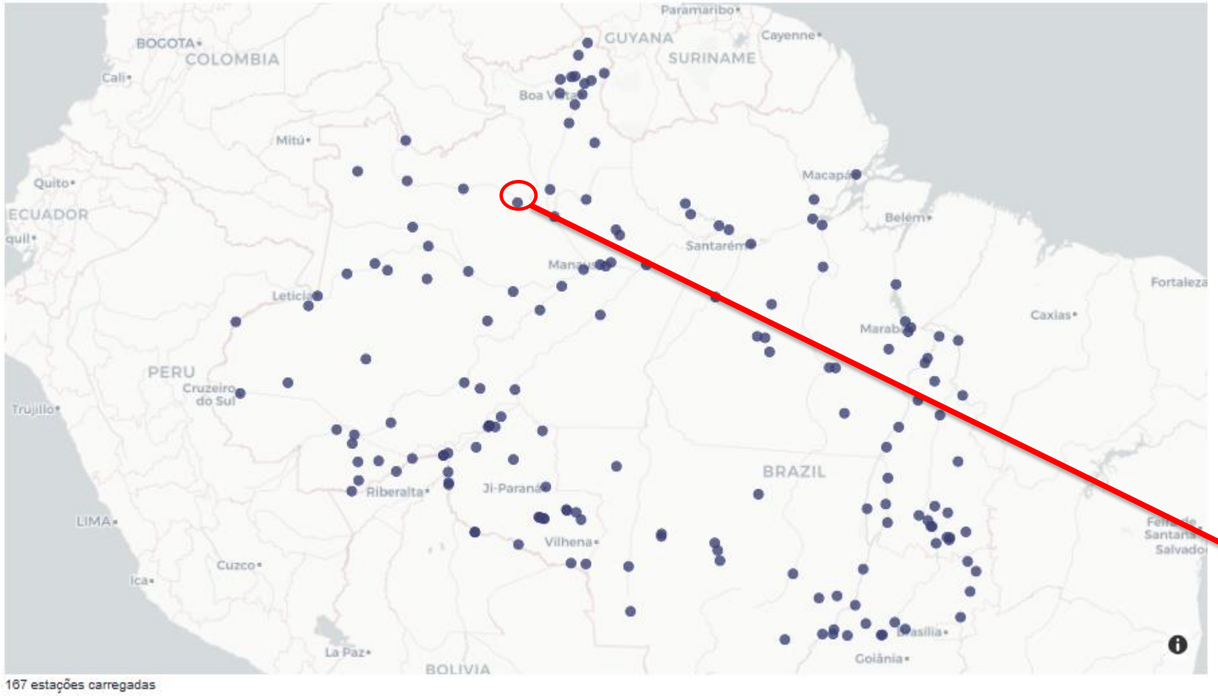


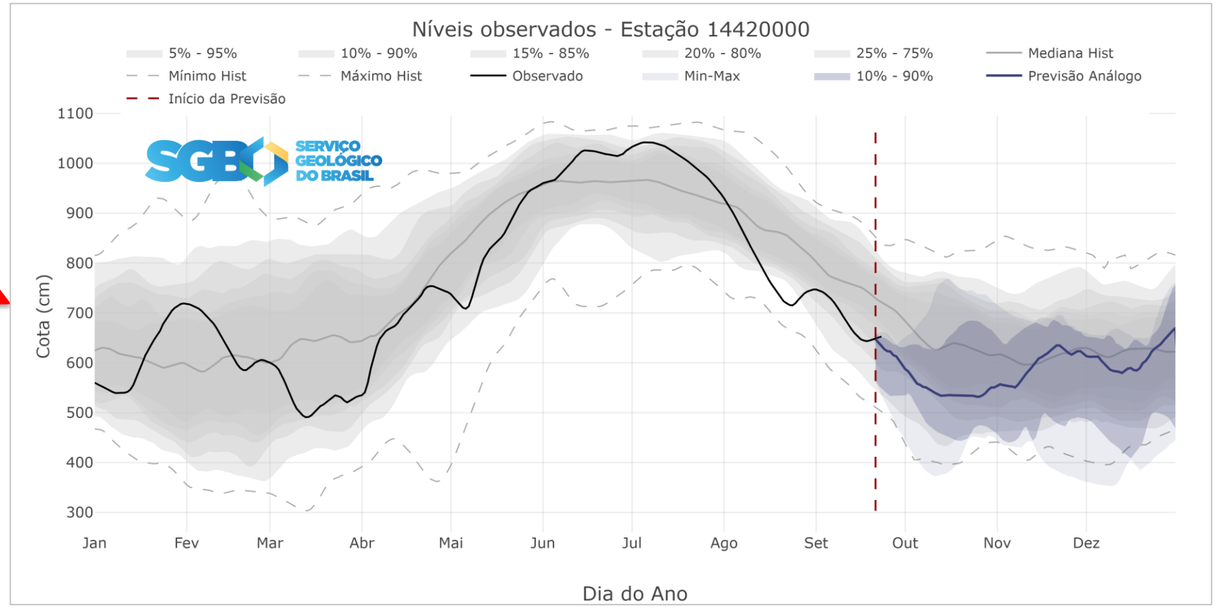
MONITORAMENTO SGB/CPRM 2026 – MODELO DE ANÁLOGOS

IA (SGB/UFSC)

Testes operacionais

SERRINHA / RIO NEGRO



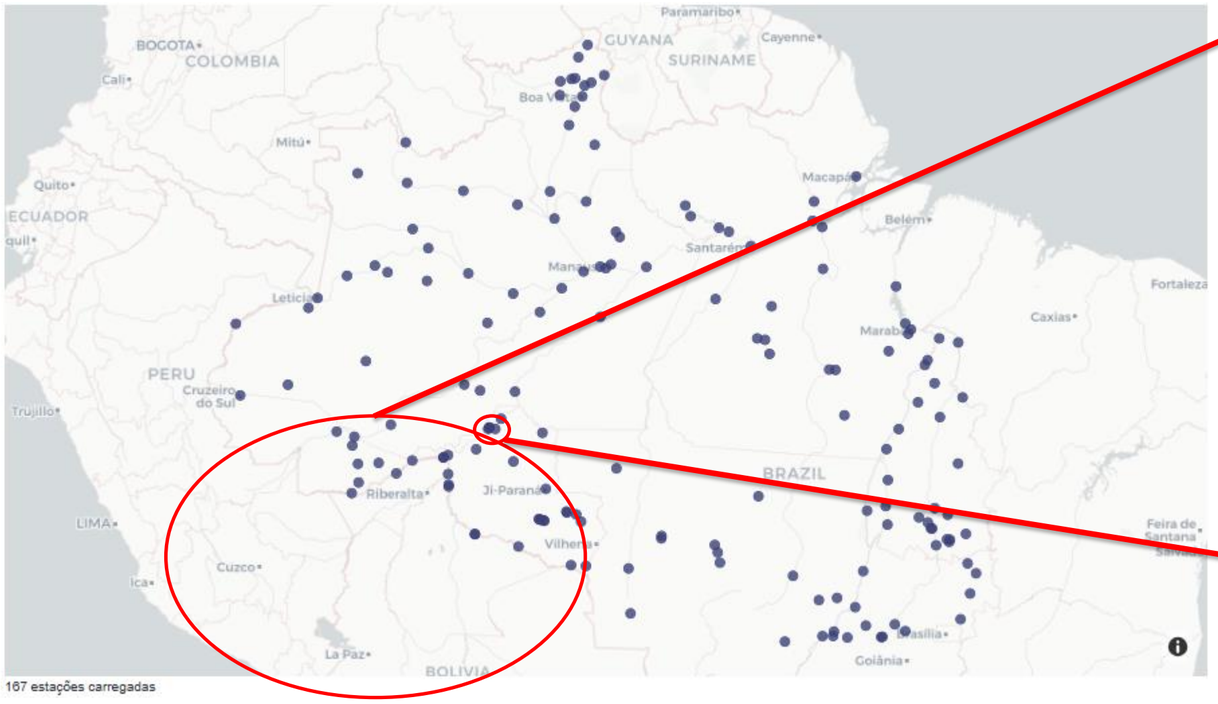


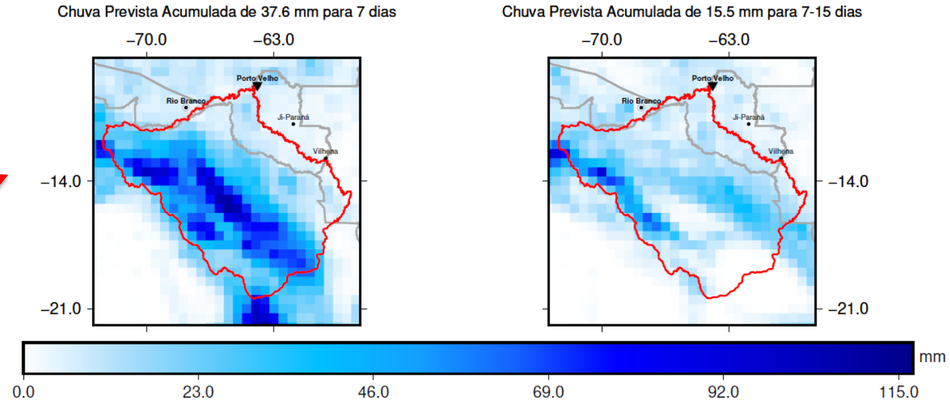
MONITORAMENTO SGB/CPRM 2026 – MODELO DE ANÁLOGOS

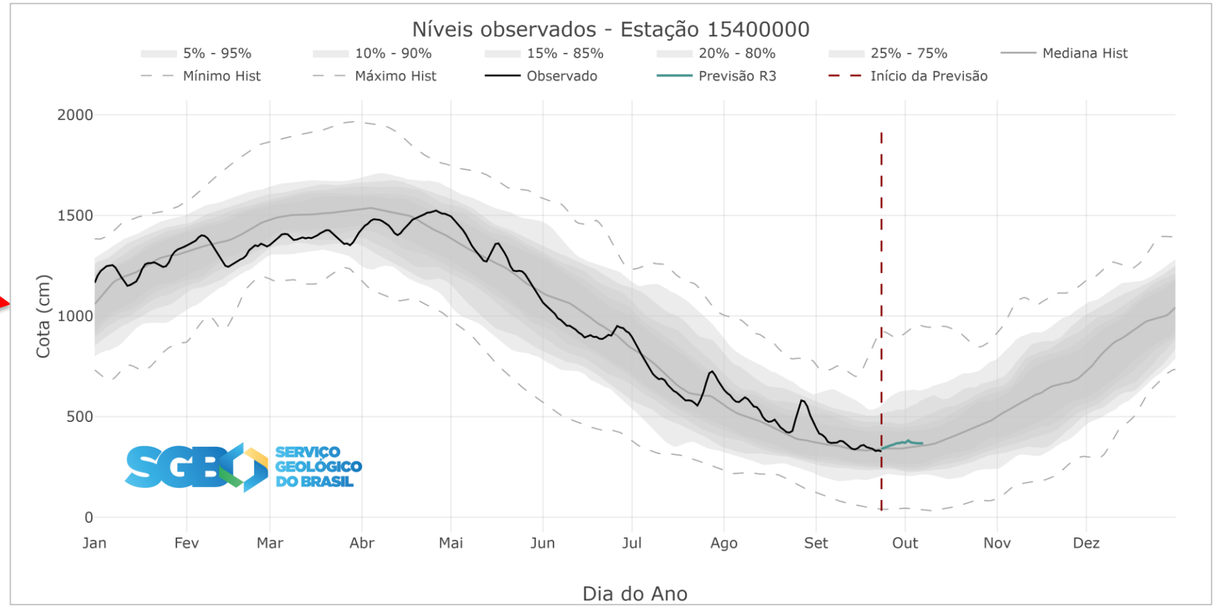
IA (SGB/UFSC)

Testes operacionais

PORTO VELHO / RIO MADEIRA





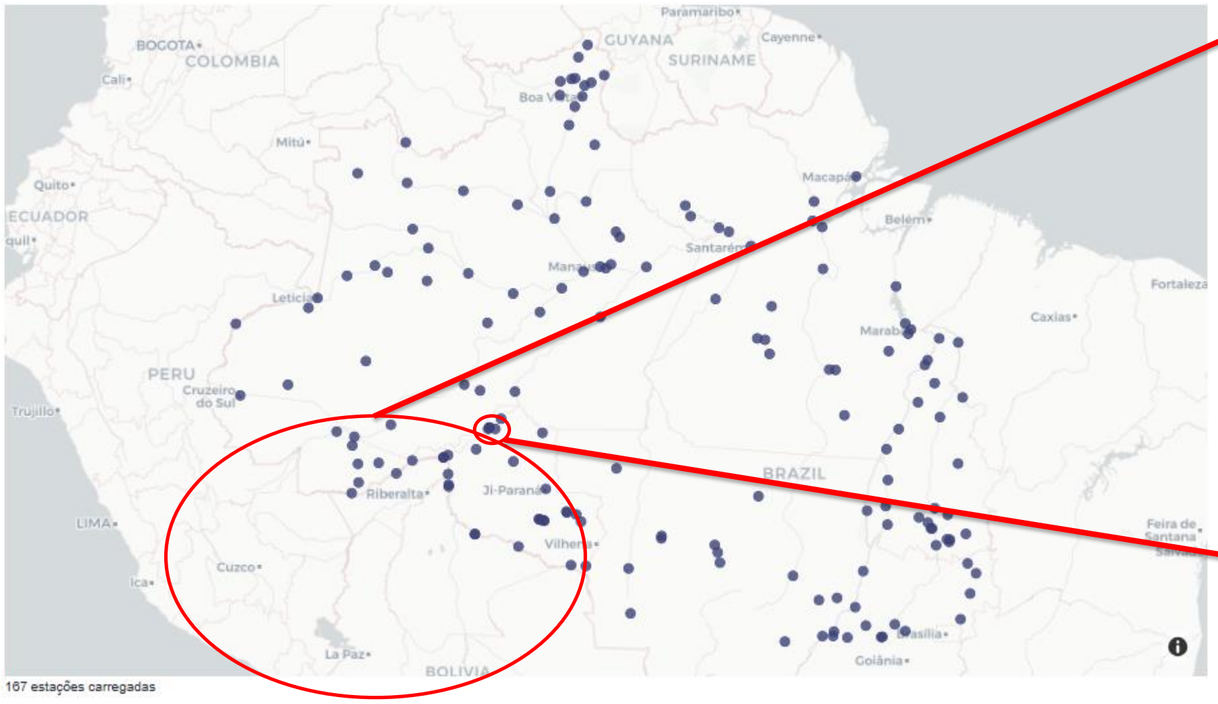


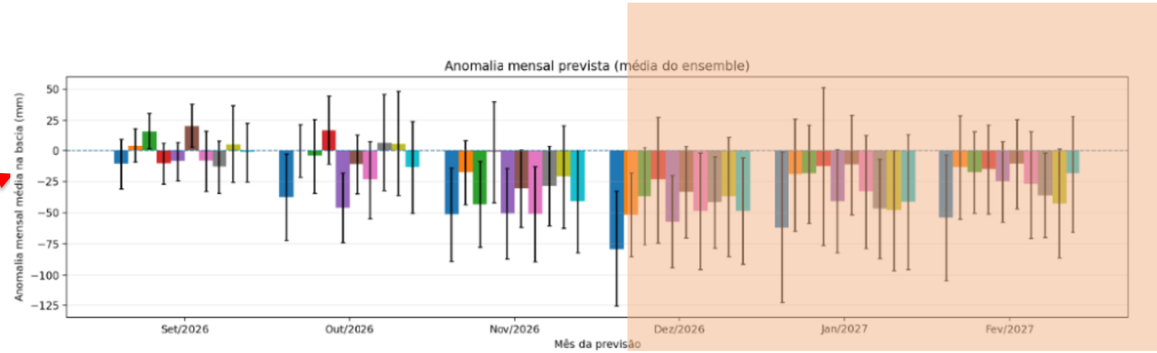
MONITORAMENTO SGB/CPRM 2026 – MODELO DE ANÁLOGOS

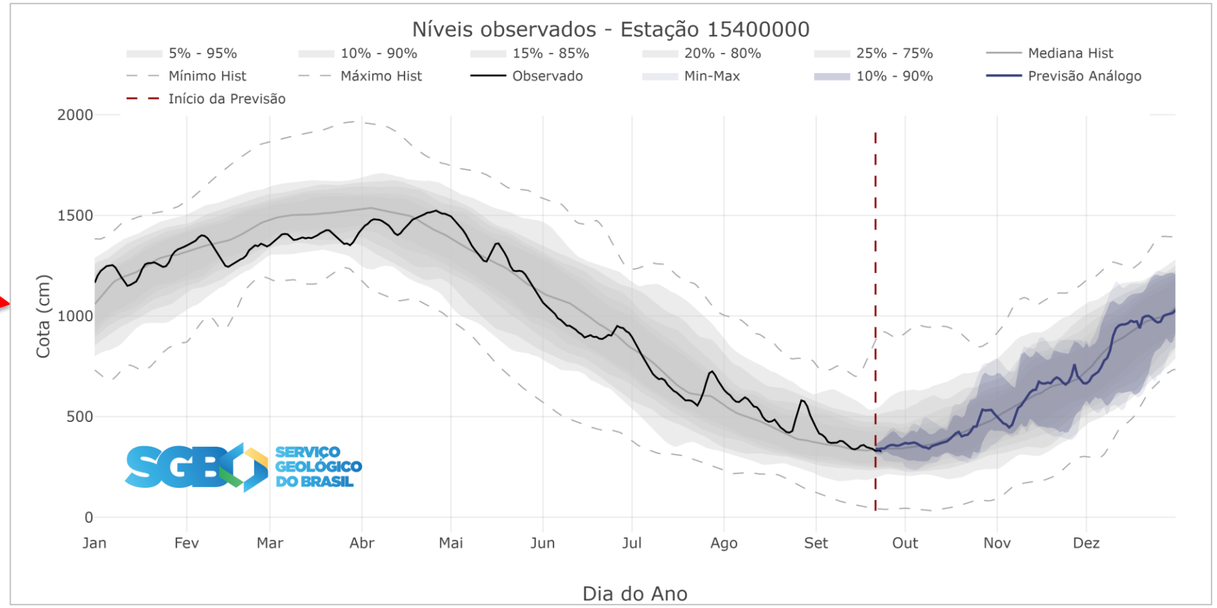
IA (SGB/UFSC)

Testes operacionais

PORTO VELHO / RIO MADEIRA





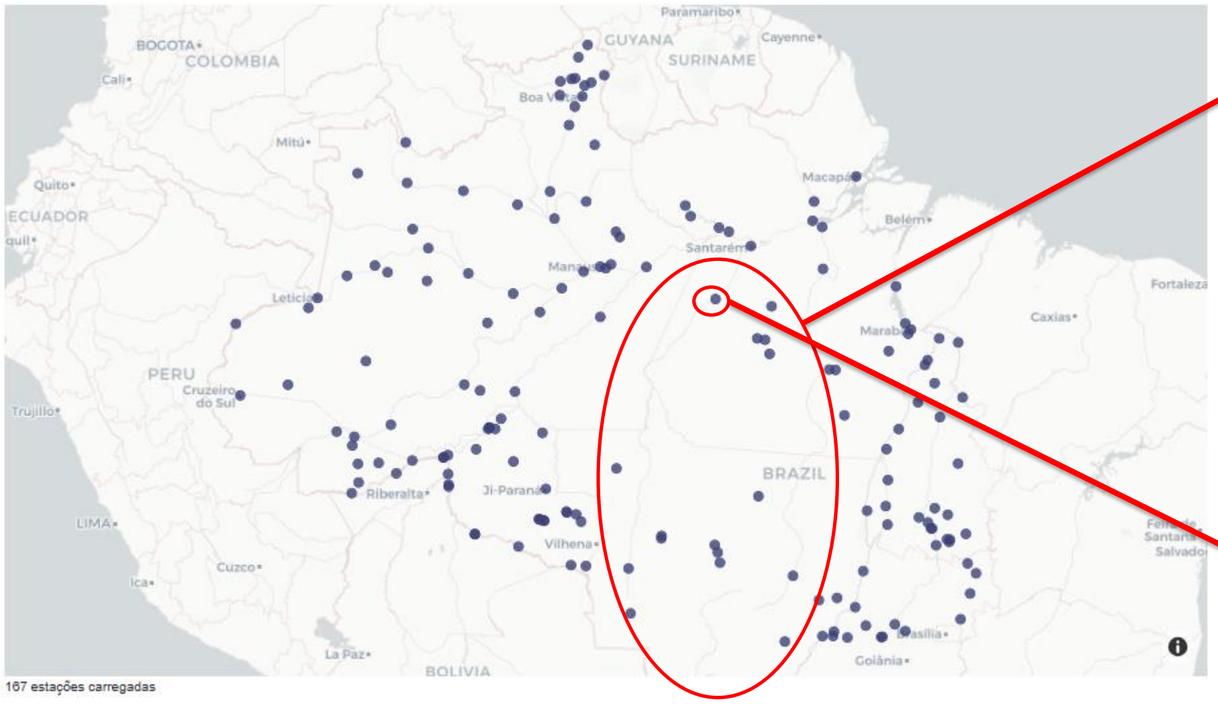


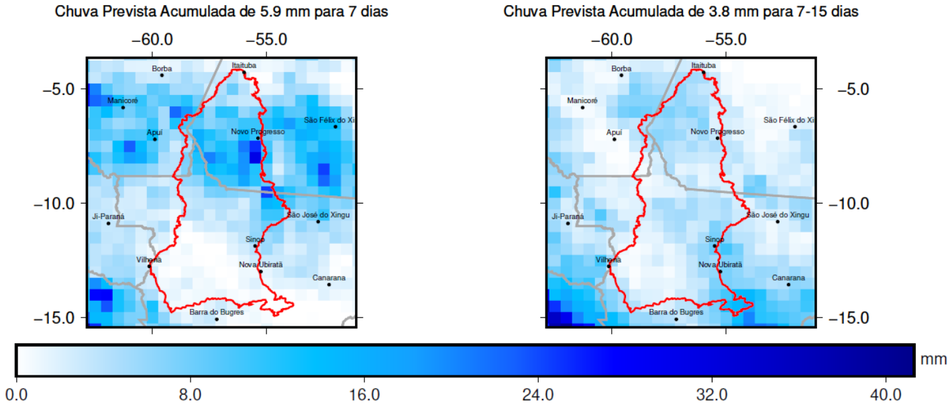
MONITORAMENTO SGB/CPRM 2026 – MODELO DE ANÁLOGOS

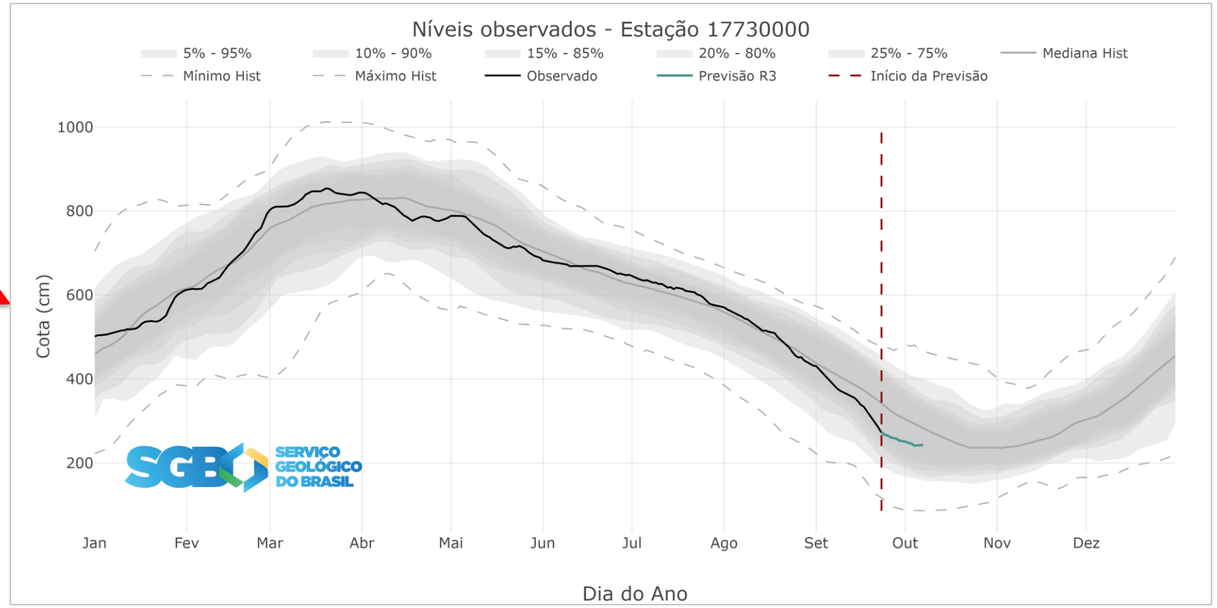
IA (SGB/UFSC)

Testes operacionais

ITAITUBA / RIO TAPAJÓS





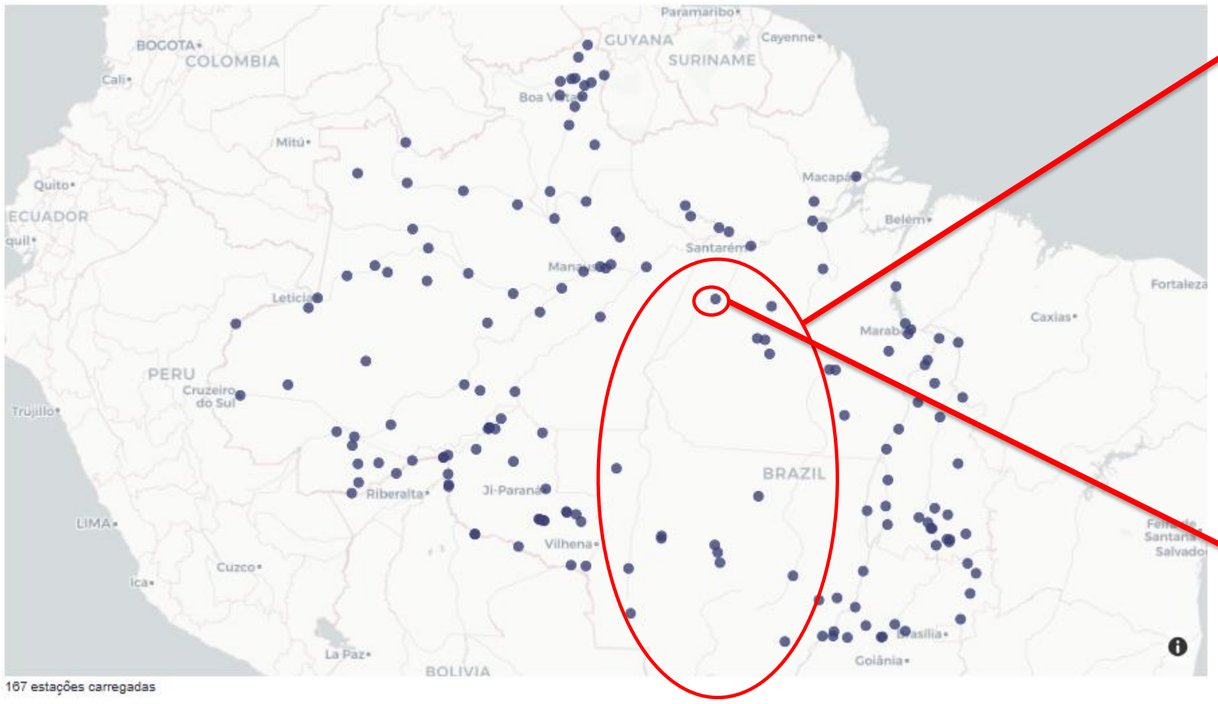


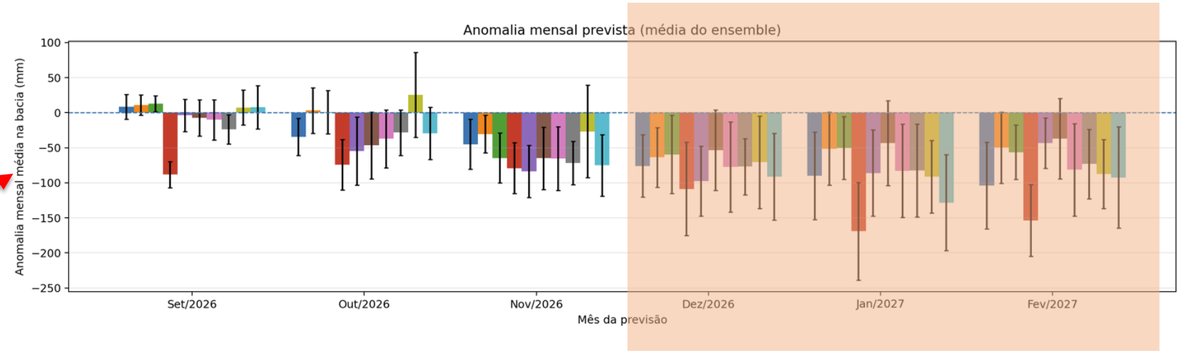
MONITORAMENTO SGB/CPRM 2026 – MODELO DE ANÁLOGOS

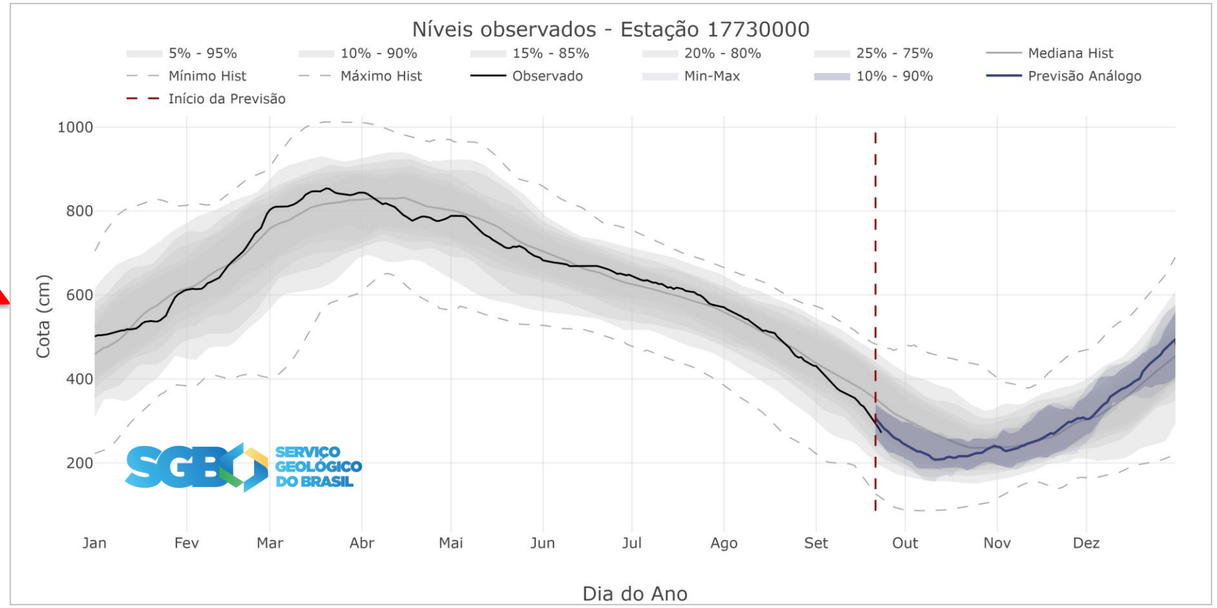
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Testes operacionais

ITAITUBA / RIO TAPAJÓS







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