UNIVERSIDADE FEDERAL
DE SANTA CATARINA

# Water Balance Estimation in Rio Negrinho Basin, Southern Brazil.


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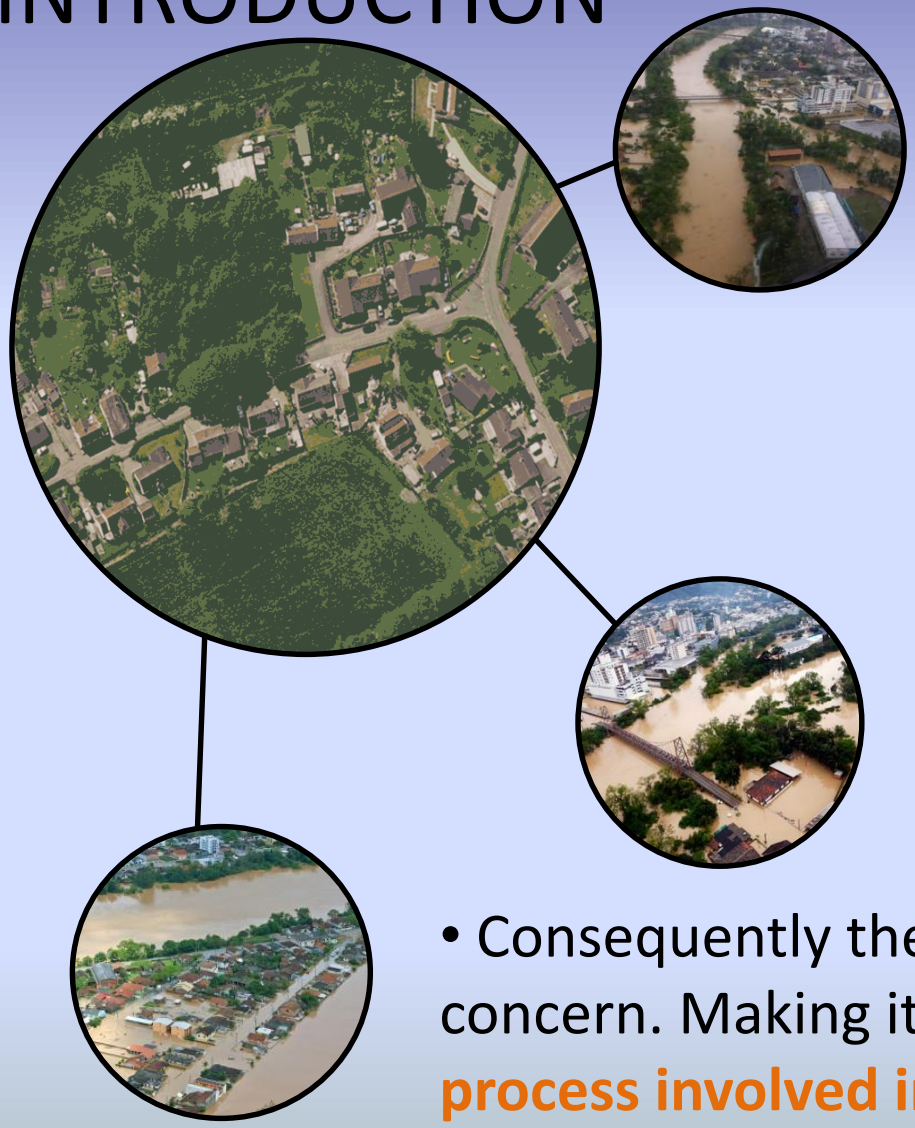
# INTRODUCTION



- In recent years, the Rio Negrinho basin has **suffered from intense hydrological events**: accelerated urbanization, soil sealing and occupation of risk areas.

- According to the ANA (National Water Agency) The Rio Negrinho river has **a high degree of vulnerability to the floods occurrence**.

• Consequently the quantity of water is a region concern. Making it important **to quantify each process involved in water balance**.

• Some papers has been developed in place to assess the basin behavior, such as: **GOERL, 2011; GIGLIO, 2011; MALUTTA, 2012 and BRIGHENTI, 2013.**

# Introduction


September flood in **2009**, in Rio Negrinho Basin. The lines marks the floods in **1992** (above) and **1983** (below). The longest line represents the river left bank of **normal conditions**.


The marks above are for the years 1983 and 1992, and de mark below is for 2010.

# Introduction

- The knowledge of the various processes that compose the **hydrological cycle** is important to estimate the **water balance** in different scenarios;

- The processes of water balance are directly influenced by the **geomorphology, soil composition, climate and vegetation.**

- Some hydrological processes considerate that are mainly:

**Precipitation**

**Runoff**

**Evapotranspiration**

**Soil-water storage**

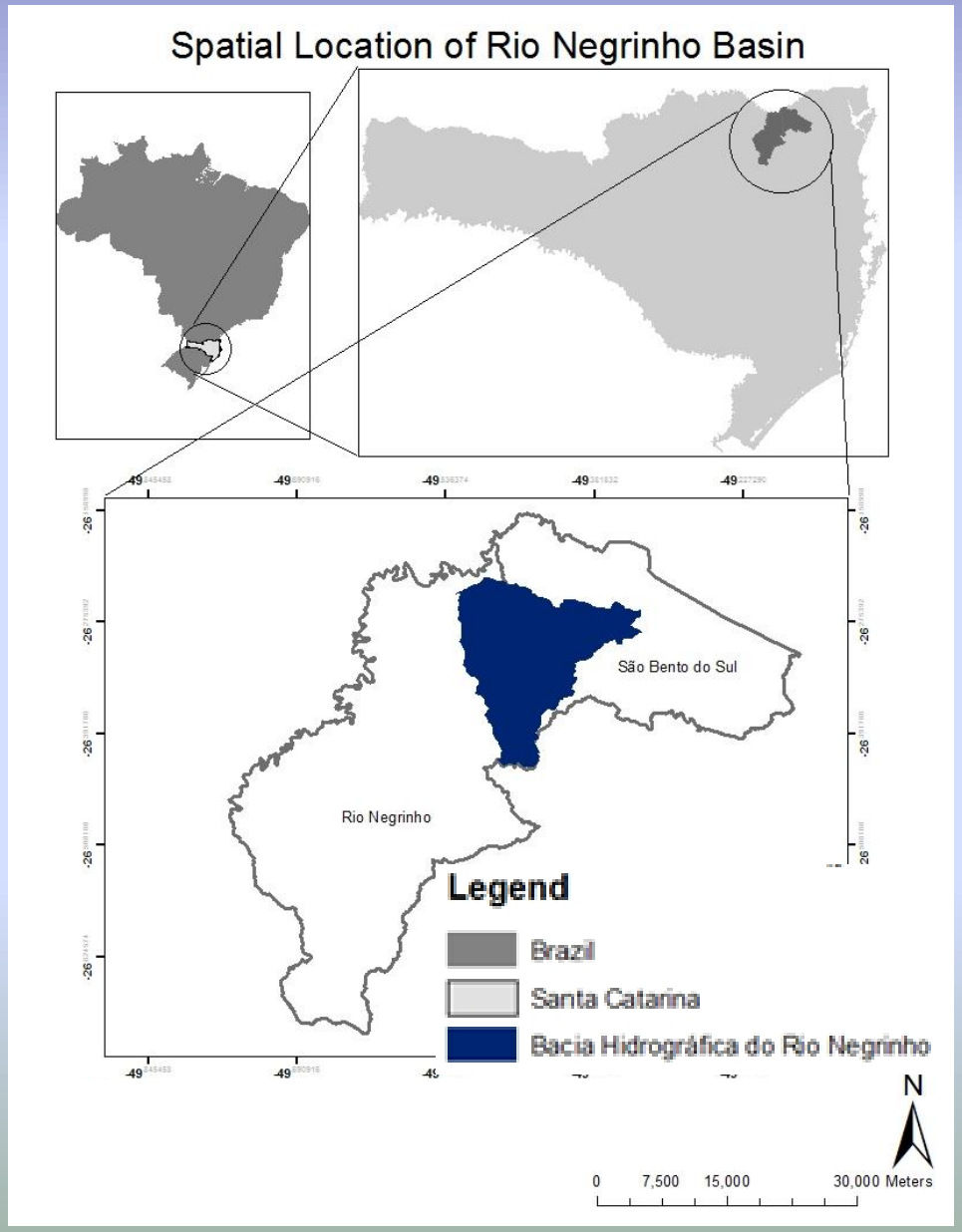
# METHODOLOGY

- The Rio Negrinho Basin have a drainage area of **200km²** (inside two cities: Rio Negrinho e São Bento do Sul).

- The regional climate type is **temperate without dry season, with cool summer**.

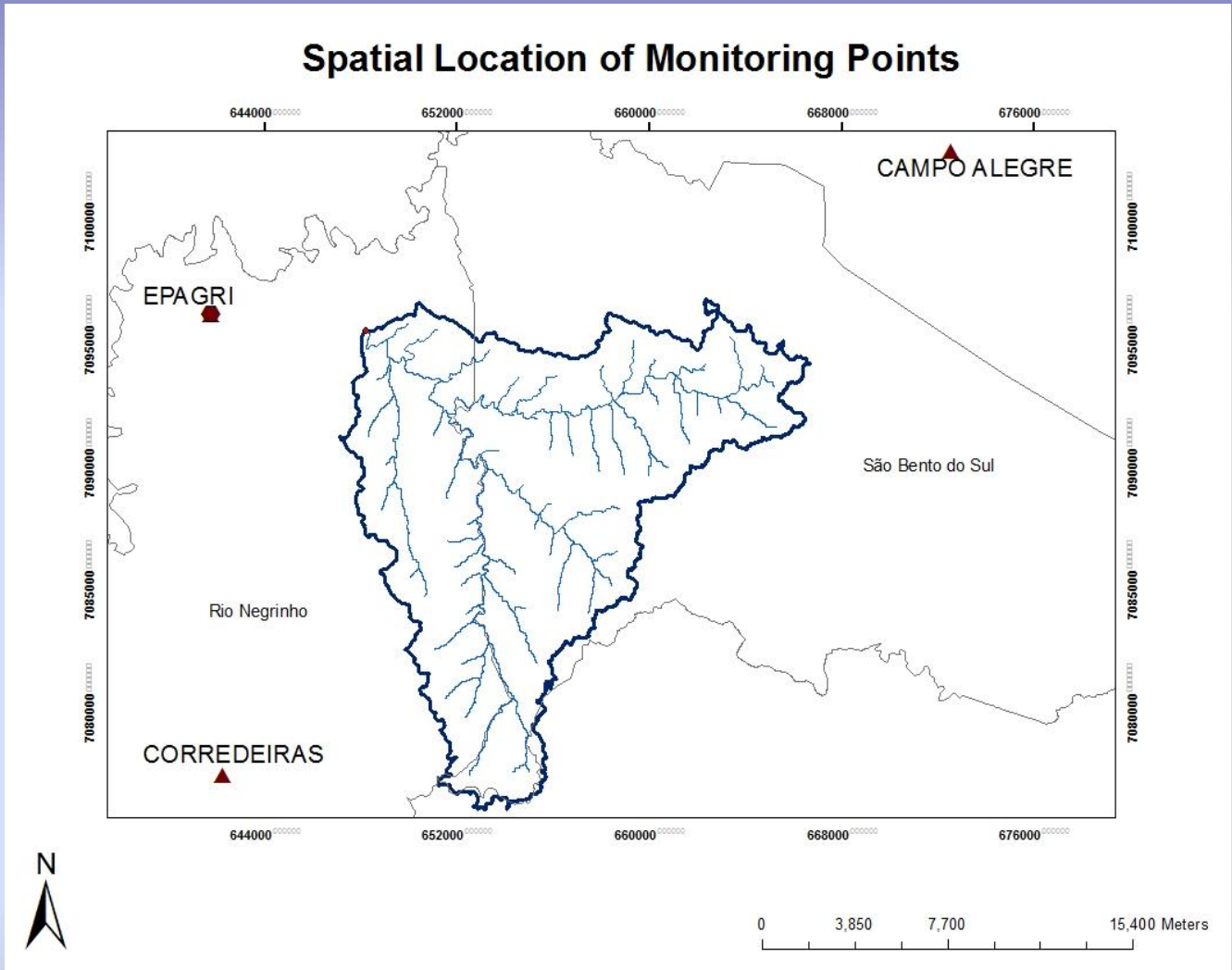
- The annual temperature ranges from **11°C to 27 °C**
- Annual rainfall is **1720mm**.

- Cambissolos
- **Mixed Ombrophilous Forest; pine reforestation and agriculture.**



# Methodology

- **Maps** of land use; DEM; soil data are found: **MALUTTA, 2012.** Brazilian soils Were added to the database model.




- Data from **three rainfall station** in a period from **1990** to **2013** was used for simulation; and one station for meteorogical data.
- The stations are respectively: **6km, 19km** and **25km** at the basin.

# Methodology

- The evapotranspiration method: **Penman/Monteith;**
- **Manning** Number was **automatically determined**;
- The runoff process made by ***SCS curve number*.**

**THE WATER BALANCE:**

$$SW_t = SW_o + \sum_{i=1}^{t} (R_{day} - Q_{sup} - E_a - W_{seep} - Q_{gw})$$

# RESULTS

- The basin have altitudes varying from **1000m to 800m**

- Cambissolo **(clay texture)**: 99%

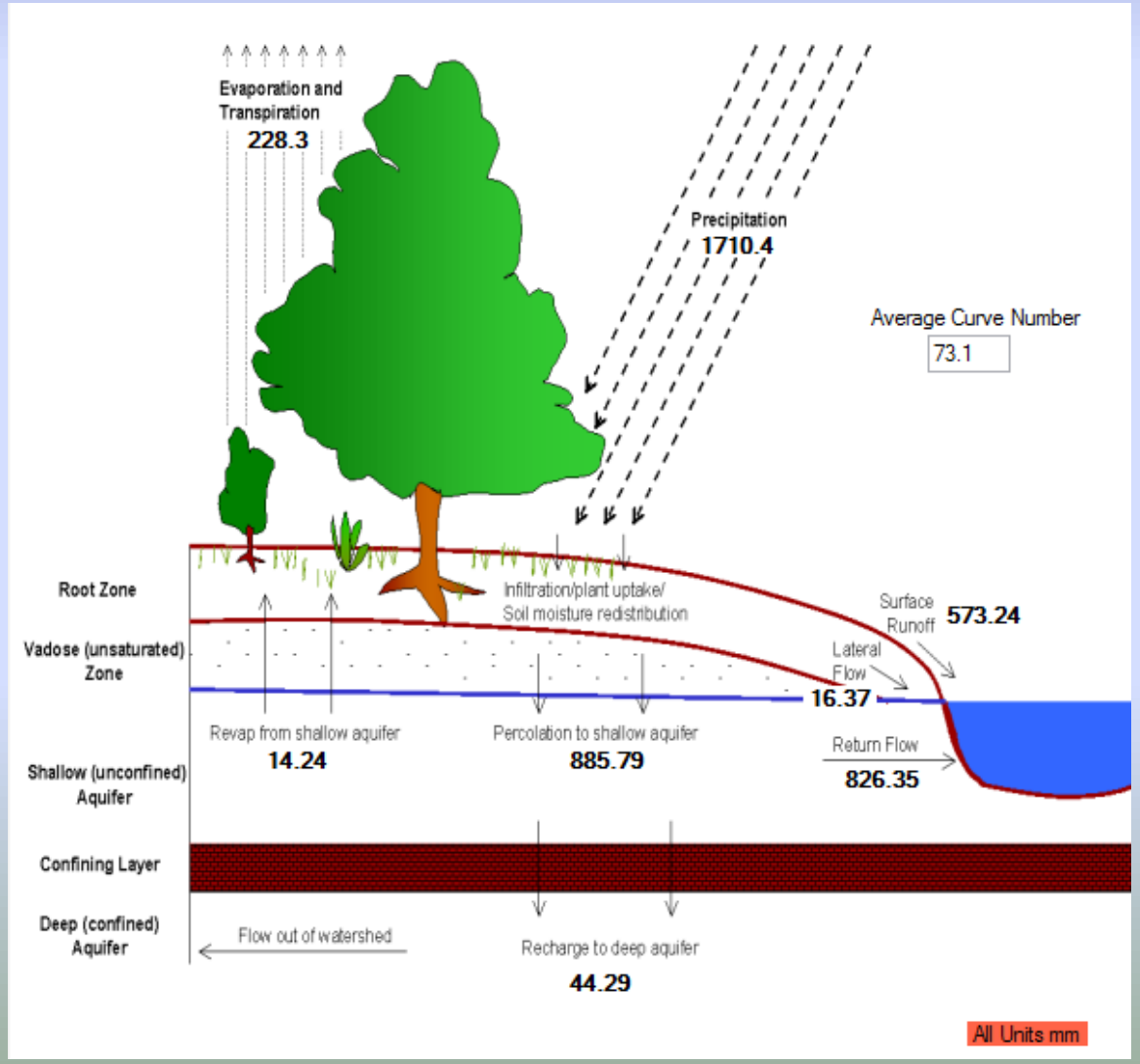
| Land Use | % of Land Use |
|---|---|
| PAST | **8.96** |
| AGRC | **4.31** |
| WATR | **0.27** |
| AGRL | **4.47** |
| URBN | **4.39** |
| FRST | **58.00** |
| PINE | **19.60** |

PAST: **Pasture**
AGRC: **Agricultural Land-Close-grown**
WATR: **Water**
AGRL: **Agricultural Land-Generic**
URBN: **Residential**
FRST: **Forest-mixed**
PINE: **Pinus**

# Results

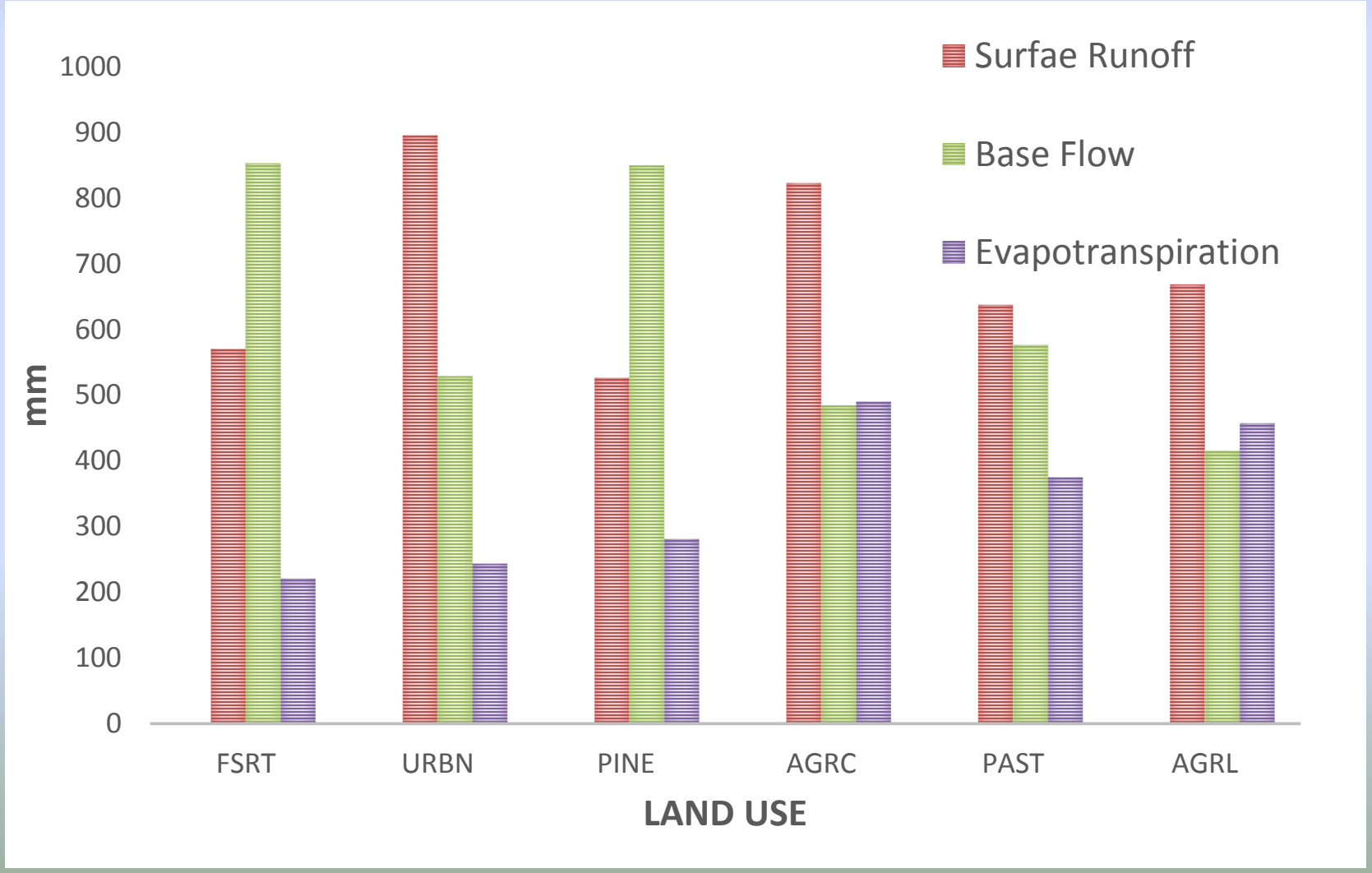
- The results presented in this study are **monthly** of **24 years simulation**.

| Water Balance Ratios | |
|---|---|
| Stream Flow/Precip | **0.83** |
| Base Flow/ Total Flow | **0.60** |
| Surface Runoff/ Total Flow | **0.40** |
| Perc/ Precip | **0.52** |
| Deep Recharge/Precip | **0.03** |
| ET/Precipitation | **0.13** |



# Results

It is also possible to obtain the simulation values of some parameters for **each land use.** (1710mm of rain)



# CONCLUSIONS

- The **SWAT** model is a **promising tool** to assess the effects of land use changes in the **water balance in Brazilian watersheds**;

- Realized the importance of SWAT model **calibration and validation** to give consistency to the results.

# Thanks!

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