Francisco Zambrano

▶ Providencia, Santiago, Chile

▶ Chilean-Italian

Skills

R/Python/Matlab

GIS/QGIS/SAGA/SNAP

Rmarkdown/Quarto

Spatial Data Analysis

Web Development

Software

▶ Git
▶ RStudio - Positron
▶ VS Code
▶ Terminal
▶ QGIS
▶ SAGA
▶ SNAP - ESA

Spatial data

▶ MODIS
▶ ERA5/ERA5-Land
▶ CHIRPS
▶ Sentinel-1/2/5p
▶ Landsat 7/8/9
▶ SoilGrid
▶ CMIP6

Awards

▶ Hackaton Winner in the Open-GeoHub Summer School, Siegburg, Germany, 2022.

Summary

Spatial data scientist and drought researcher with >15 years of experience in remote sensing, hydroclimatic modeling, and agricultural adaptation to climate change. PI of competitive grants totaling >CLP 1,200 million (ANID Fondecyt, Anillos, FONDEF). Led the development of national platforms ODES-Chile (drought observatory) and SatOri (cherry irrigation optimization). Expertise in MODIS, Sentinel, CHIRPS, machine learning, and reproducible science with R/Python.

Projects

The National Agency for Research and Development (ANID) has awarded me more than **CLP 1,200 MM** in funding.

Fondecyt Regular 2026 (On evaluation) — 01/2026
Principal Researcher, **CLP 212 MM**

Title: From Drought to Resilience: A New Framework for Climate-Adaptive Agriculture Through Water-Efficient Crops and Landscape Optimization in Aridified Regions

Anillos de Investigación en Áreas Temáticas 2025 (Funded) — 10/2025
Leading director, **CLP 660 MM**

Title: Towards sustainable agricultural adaptation amid water scarcity and declining biodiversity in the Aconcagua Basin.

ODES-Chile (FSEQ210022) — 03/2022 - 10/2023
Leading director, **CLP 300 MM**

We created ODES-Chile, a multi-scale drought observatory for Chile, an early warning system to mitigate agricultural and ecological impacts. (https://odes-chile.org).

SatOri (ID21I10297) — 03/2022 - 12/2024
Leading director, **CLP 200 MM**

We created SatOri, a satellite system for optimizing irrigation in cherry orchards (https://s4tori.cl).

Fondecyt Iniciación 11190360 — 03/2020 - 03/2022
Principal researcher, **CLP 100 MM**

I led research that evaluated biomass prediction in wheat and corn using satellite data and machine learning techniques.

Co-researcher projects — 2021-2025
Universidad Mayor

- I sponsored the project **Fondecyt Postdoctorado** titled *Assessing Current and Future Water Availability for Agriculture and Terrestrial Ecosystems Under Different Land-Use Scenarios in the Aconcagua Basin: Toward Adaptation to Drought*.
- I led the remote sensing part of the projects **Fondecyt Regular (1210526)** titled *Multivariate drought monitoring system: biophysical modeling, remote sensing, and hydroclimatic information for drought analysis and prediction in agriculture* and the **Anillo (ACT210007)** titled *Modeling regulatory networks of epigenetic genes in cherry flower buds in response to contrasting seasonal climatic conditions*.

- Doctorate Scholarship, National Research & Development Agency, Chile, 2014.

Journals Reviewer

- More than 114 reviews of 28 publications between 2018-2025. Mostly Q1 articles.

Education

03/2014 - 09/2017

PhD. in Agricultural Engineering, mention in Water Resources
Universidad de Concepción

Thesis: Agricultural drought in Chile: from assessment to prediction using satellite data

03/2000 - 09/2007

Agricultural Civil Engineer

Universidad de Concepción

Thesis: Effect of differential application of water and fertilizer on the production and quality of the Carmenere grape variety

Languages

- English - Advanced (B2-C1)
- Spanish - Native

Contact

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Experience

Associate Professor — 02/2018 - 08/2025
Earth Observation Center
Hemera - Universidad Mayor

I developed and taught multiple undergraduate and graduate courses in GIS (QGIS) and spatial data science (R), focusing on practical applications for environmental and territorial management. Key courses included Introduction to GIS (course link), Advanced Use of GIS with R (course link), Spatial Analysis with R (course link), and Data Mining (course link), where I trained students in vector/raster data management, coordinate reference systems, spatial operations, interpolation methods, and reproducible analysis (with open course links).

Visiting Scholar — 09/2016 - 12/2016
Faculty of Geo-Information Science and Earth Observation (ITC)
Univerity of Twente, The Netherlands

I led a study to predict drought-induced agricultural productivity declines in Chile, integrating time series satellite data (MODIS, CHIRPS) and advanced spatial analysis techniques. The results of this research were published in the journal Remote Sensing of Environment.

Visiting Scholar — 01/2016 - 06/2016
CALMIT/NDMC
University of Nebraska, United States

I led a study on the evaluation of satellite products for estimating precipitation in Chile and their applicability for drought monitoring. The results were published in the journal Atmospheric Research.

Teaching Experience

Spatial Analysis with R. Lecturer. Graduate Program — 2019-2023
Universidad Mayor

I trained students in theoretical concepts and the practical application of spatial interpolation methods using R software (course link).

Advanced Use of Geographic Information Systems. Lecturer. Undergraduate Program — 2022-2025
Universidad Mayor

I taught theoretical and practical classes to train students in the use of R as a powerful Geographic Information Systems (GIS) tool. Topics covered included the management of vector and raster data, as well as the application of spatial operations for geospatial analysis (course link).

Introduction to Geographic Information Systems. Lecturer. Undergraduate Program — 2023-2025
Universidad Mayor

Instruction and training in Geographic Information Systems (GIS) using the open-source software QGIS. I designed and delivered practical workshops on key concepts such as: introduction to GIS, management of vector and raster data, coordinate reference systems, and spatial analysis (course link).

Data Mining. Lecturer. Undergraduate Program `2021-2022`
Universidad Mayor

I trained students in processes of importing, organizing, and transforming data, using R software for data science (course link).

Management of Geographic Information. Lecturer. Undergraduate Program `2019-2022`
Universidad Mayor

Instruction and training in Geographic Information Systems (GIS) using the open-source software QGIS. I designed and delivered practical workshops on key concepts such as: introduction to GIS, management of vector and raster data, coordinate reference systems, and spatial analysis.

Soil-Plant-Water Relationships. Lecturer. Undergraduate Program `2018`
Universidad Mayor

I introduced the fundamental concepts of the principles of soil-plant-atmosphere water relations and water transport in this system.

Selected Publications

1. **Zambrano, F.**, Anton, V., Meza, F., Duran-Ilacer, I., Fernández, F., Venegas-González, A., Raab, N., Craven, D., 2025. From Drought to Aridification: Land-cover fingerprints of a drying Chile. **Earth's Future (F.I. 8.2)**. https://doi.org/10.1029/2025EF006744

2. **Zambrano, F.**, Herrera, A., Olguín, M., Miranda, M., Garrido, J., & Almeida, A. M. (2025). Prediction of the daily spatial variation of stem water potential in cherry orchards using weather and Sentinel-2 data. **Agricultural Water Management (F.I. 6.5)**, 318, 109721. https://doi.org/10.1016/j.agwat.2025.109721

3. **Zambrano, F.**, 2023. Four decades of satellite data for agricultural drought monitoring throughout the growing season in Central Chile, in: Vijay P. Singh Deepak Jhajharia, R.M., Kumar, R. (Eds.), Integrated Drought Management, Two Volume Set. CRC Press, p. 28.

4. **Zambrano, F.**, Vrieling, A., Nelson, A., Meroni, M., Tadesse, T., 2018. Prediction of drought-induced reduction of agricultural productivity in Chile from MODIS, rainfall estimates, and climate oscillation indices. **Remote Sensing of Environment (F.I. 11.4)** 219, 15–30. https://doi.org/10.1016/j.rse.2018.10.006

5. **Zambrano, F.**, Wardlow, B., Tadesse, T., Lillo-Saavedra, M., Lagos, O., 2017. Evaluating satellite-derived long-term historical precipitation datasets for drought monitoring in Chile. **Atmospheric Research (F.I. 4.4)** 186, 26–42. https://doi.org/10.1016/j.atmosres.2016.11.006