Project: 1207
Project title: Decadal Variability of the Tropical Pacific – El Niño Events
Principal researcher: Dimitry Sein
Report period: 2025-01-01 to 2025-10-30

Over the course of the year, the following activities were carried out in the frame of this project:

1. Identification of Seasonal Precipitation Patterns in the San Martín Region in Peru through the Analysis of Self-Organizing Maps (SOM) in the 1981-2016 Period.

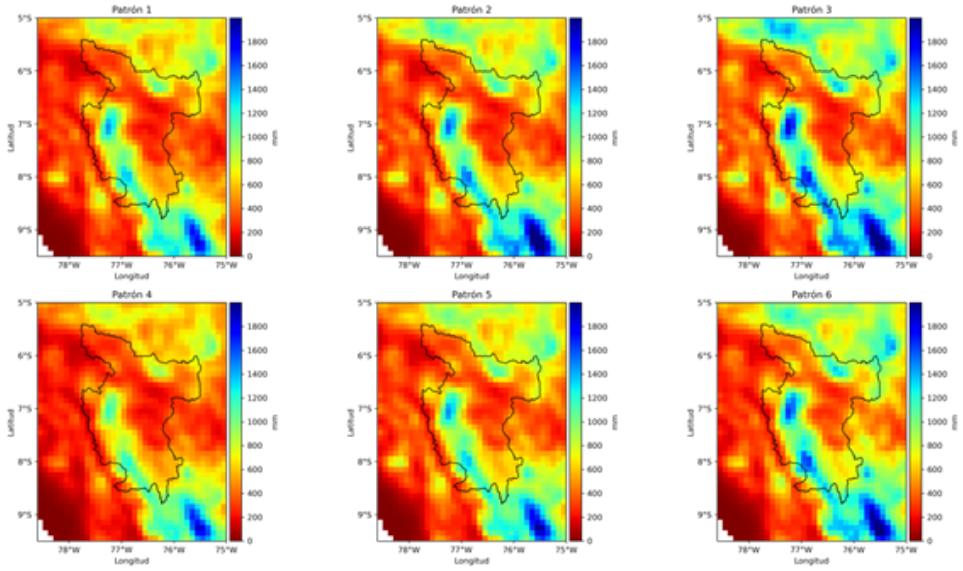
The Self-Organizing Maps (SOM) method is an artificial intelligence tool used for exploratory data analysis and the visualization of complex relationships. Based on neural network theory, SOMs organize data into a regular grid where similar models are grouped in nearby nodes, allowing the identification of patterns and relationships in high-dimensional datasets. This technique, inspired by the functioning of the human brain, is applied in various fields, including climatology, where it is used to classify and analyze complex atmospheric patterns, such as synoptic circulation and its relationship with local climate variables.

Table 1. Dry and Wet Periods for the San Martin Region 1981-2016

DJF		MAM		JJA		SON	
WET	DRY	WET	DRY	WET	DRY	WET	DRY
1998	1983	1983	1987	1999	1982	1982	1983
1999	1985	1984	1988	2000	1983	1984	1988
2009	1989	1993	1990	2013	1985	1987	1991
2011	1991	1998	1992		1986	1989	1992
2012	1992	2009	1995		1992	1990	2000
	1995	2013	1997		1997	1993	2015
	2002	2014	2003			2014	2016
	2004	2015	2004			2011	
	2005		2016			2013	
	2007						

Six precipitation patterns were identified through self-organizing map (SOM) mapping using quarterly precipitation totals. For the DJF (December-January-February) trimester, two extreme patterns stood out: one very wet, with totals of up to 2,000 mm (Pattern 3), and another drier with totals below 250 mm (Pattern 4). The patterns reflect a distribution of rainfall similar to local climatic conditions, with the most intense accumulations in the Central Andes Mountain range. Pattern 3 shows values of up to 1,800 mm in certain areas, while Pattern 4 is the most common, with a frequency of 27.7%, followed by Pattern 5 with 19.4%. Pattern 1, the least frequent, was observed in only 4 summers.

SOM PATTERNS FOR THE DEC-JAN-FEB PERIOD



TOTAL, FREQUENCY OF EACH PATTERN DEC-JAN-FEB 1981-2016