

Emerging Solutions to Real-World Use Cases





Dr. Ekasit Phermphoonphiphat (Oue)

CTO at VEKIN (Thailand) Co., Ltd.

PhD: Osaka University – Information Science (AI)

Master: Chulalongkorn University – Computer Science (AI)

Bachelor: Thammasat University – Computer Science (AI)

Experiences

- PhD in Machine Learning, Osaka University
- IT and Machine Learning Consultant
- Specialist in Machine Learning and Advanced Technologies
- Mentor and Instructor in Machine Learning
- Expert in Technology for Sustainability Ecosystem Business
- Selected for "Growth 4" by NIA
- 1st Place Winner in "Space Economy: Lifting Off 2023"
- AI Mentor at "CAICamp 2022-2024"
- Speaker at "TH.ai Forum - AI Trends in Manufacturing"
- 2022 Microsoft Imagine Cup World Finalist
- President of TSAJ 79th - "Thai Students' Association in Japan Under Royal Patronage"

Contact: ekasit@vekin.tech



Introduction

- Increasing climate remote sensing, including re-analysis data cause a massive amount of data.
- **Numerical weather prediction (NWP)**
 - Imperfect observations cause errors to grow over time.
 - Needs climatology knowledge.
 - Consumes a lot of computational resources.
- In **machine learning (ML)**, there are applications on climate domain such as tropical cyclone forecasting, long-term rainfall prediction.



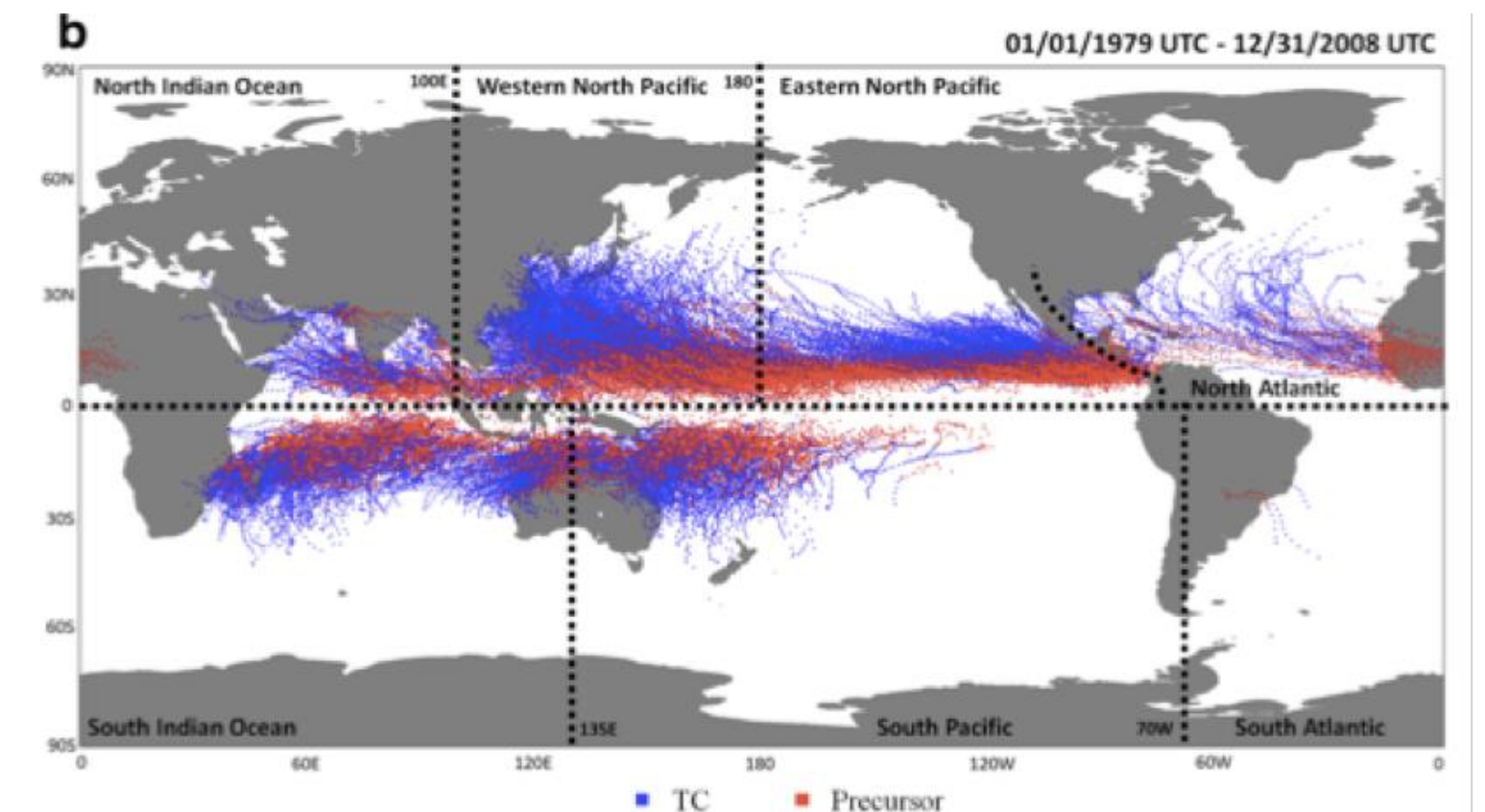
Himawari-8 Satellite

[<https://public.wmo.int/en/resources/meteoworld/facilitating-use-of-new-himawari-8-satellite-data>]



Automated Meteorological Data Acquisition System (AMeDAS, アメダス)

[https://en.wikipedia.org/wiki/Automated_Meteorological_Data_Acquisition_System]

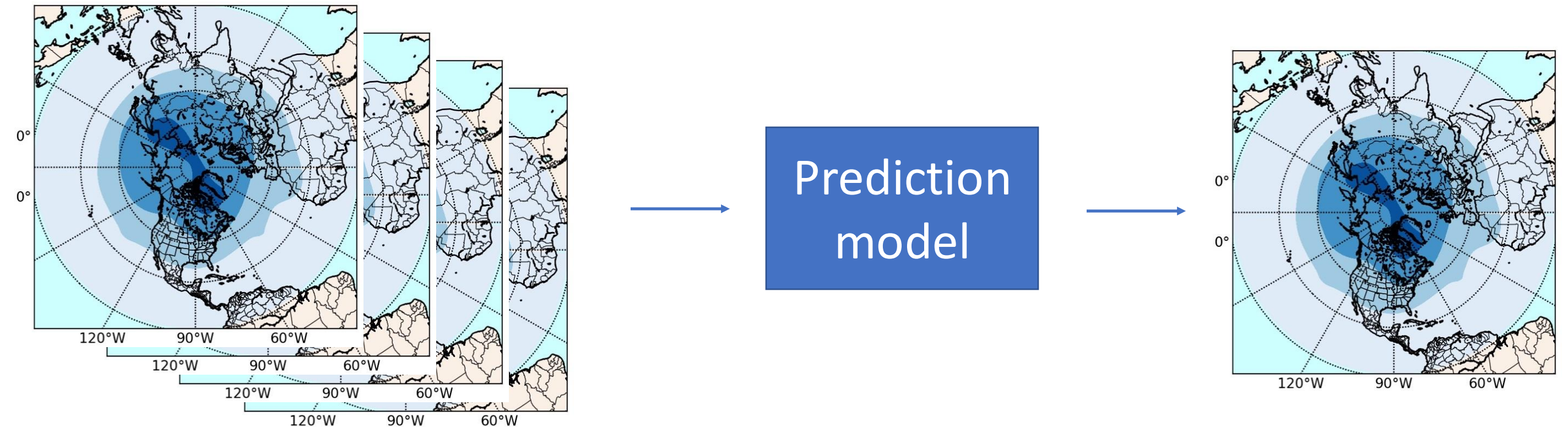


Deep learning approach for detecting tropical cyclones and their precursors

[Matsuoka et al., 2018]

Climate Prediction Model

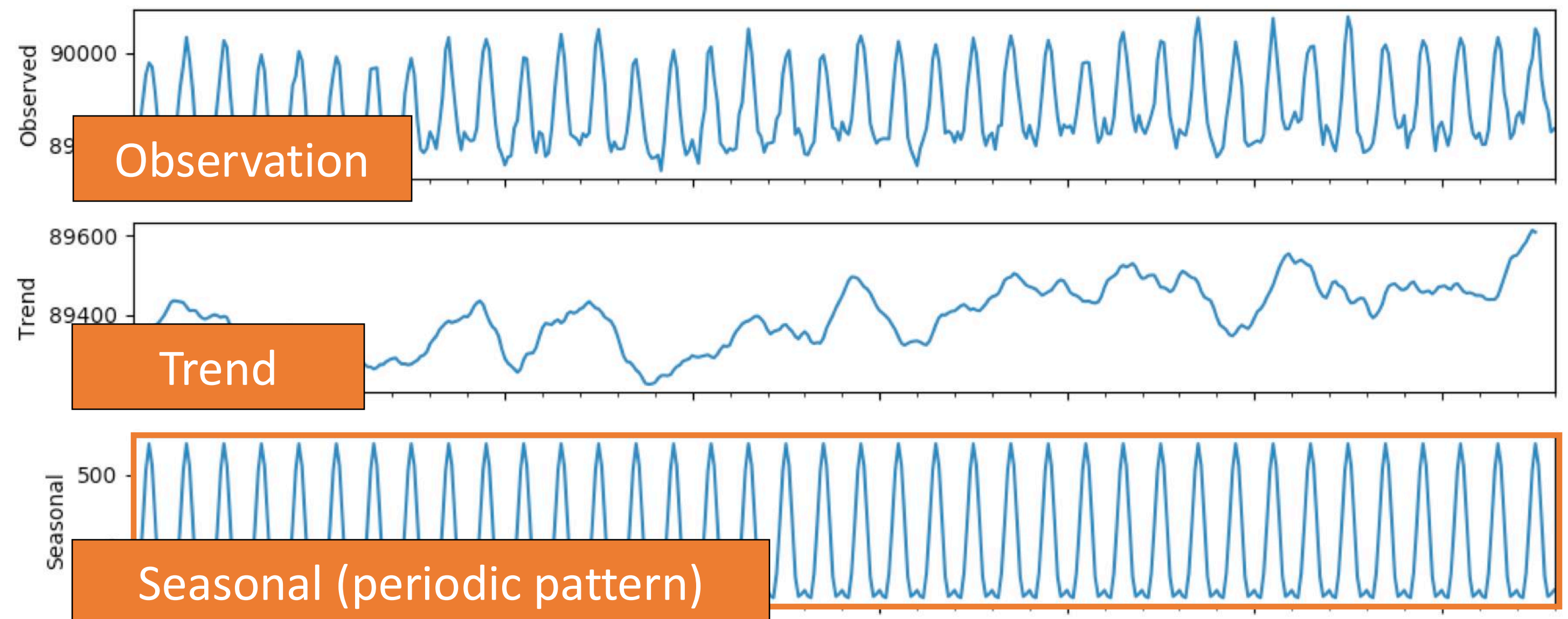
- Most climate prediction model learns on the **input sequence**.



Sequential input
(prior)

Prediction
output

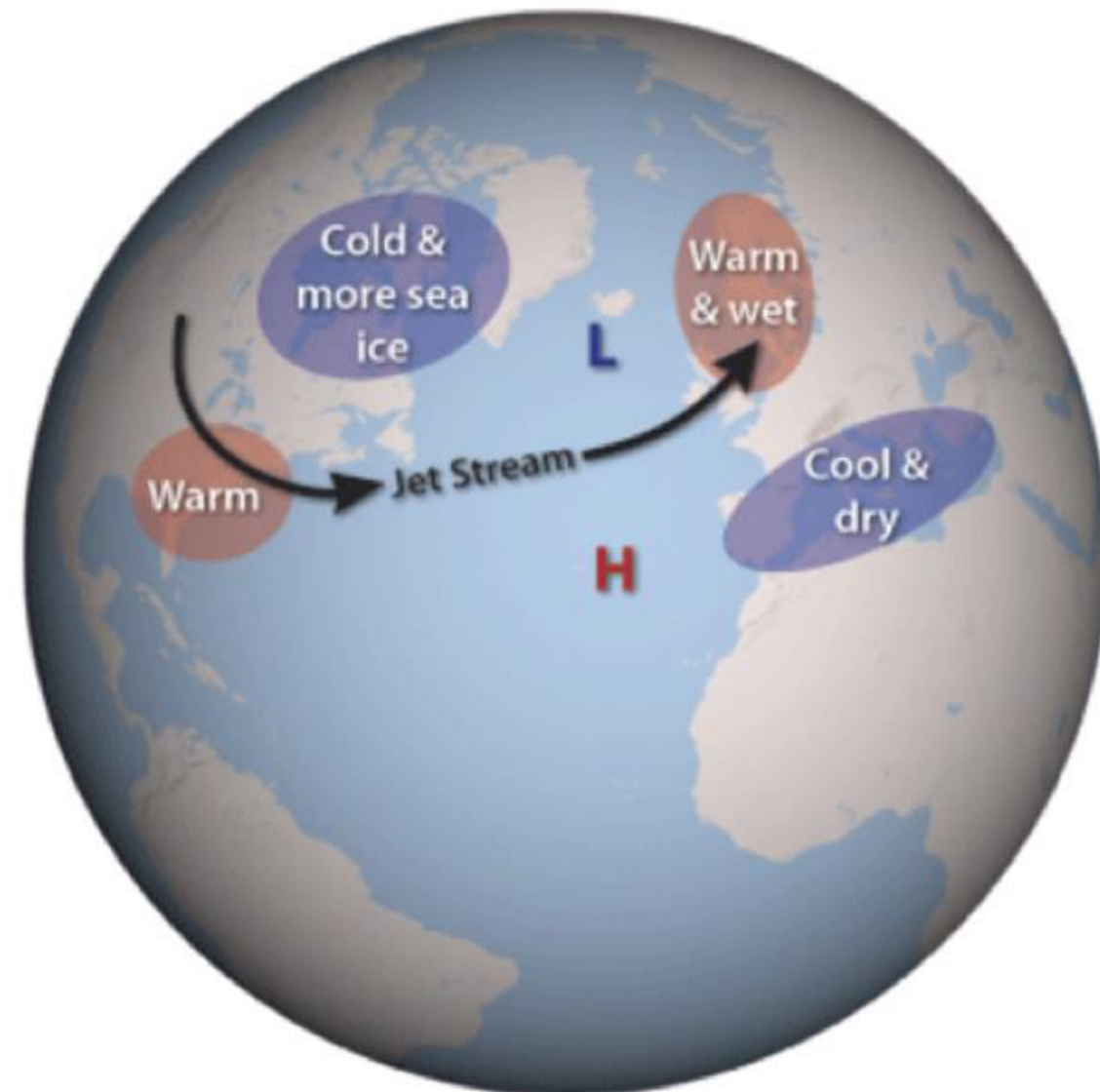
- The **seasonal component** is one of the component in climate data.



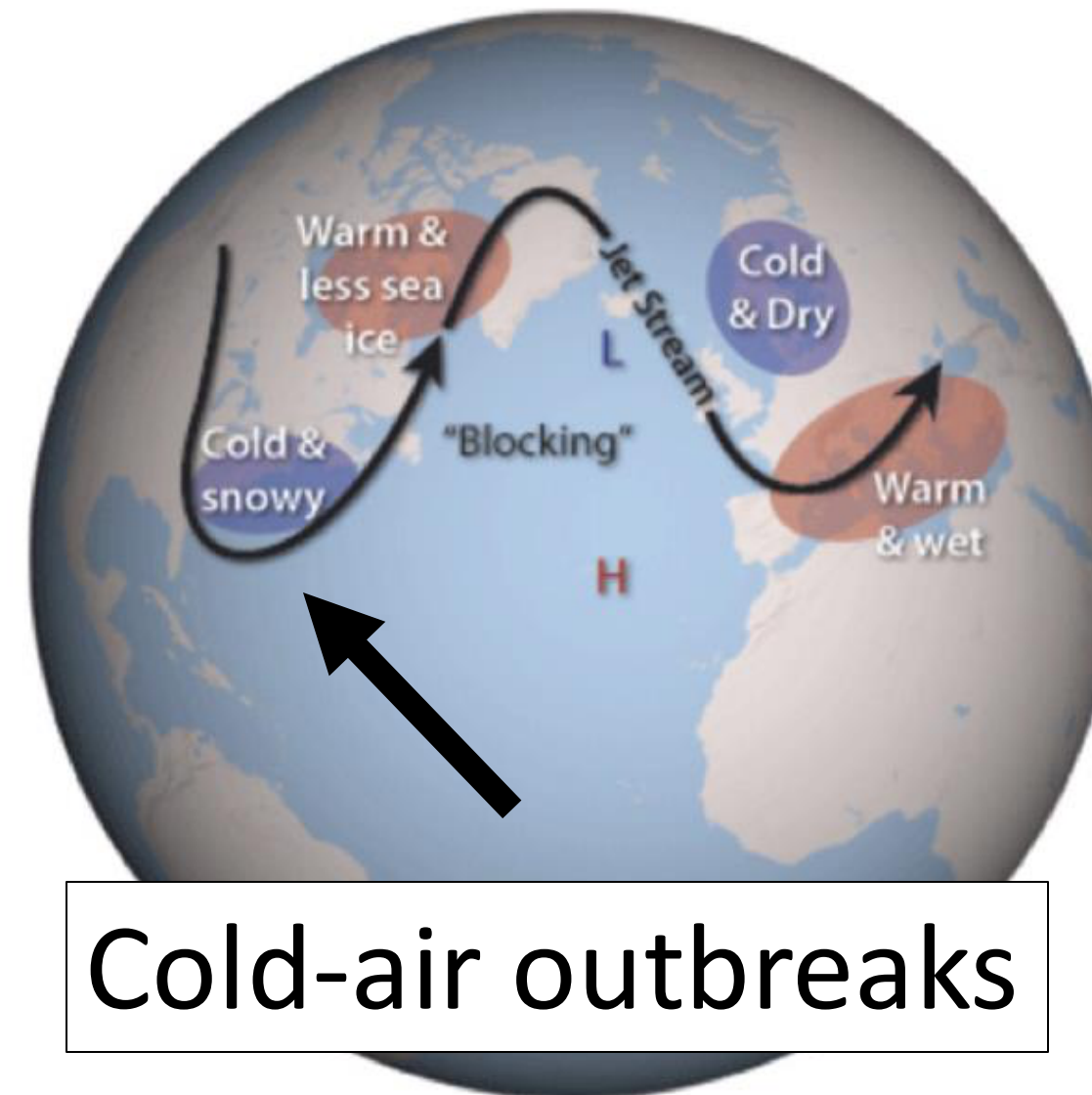
Climate Periodicity

- A periodic pattern, e.g., seasonality, exists in a global spatiotemporal climate pattern.

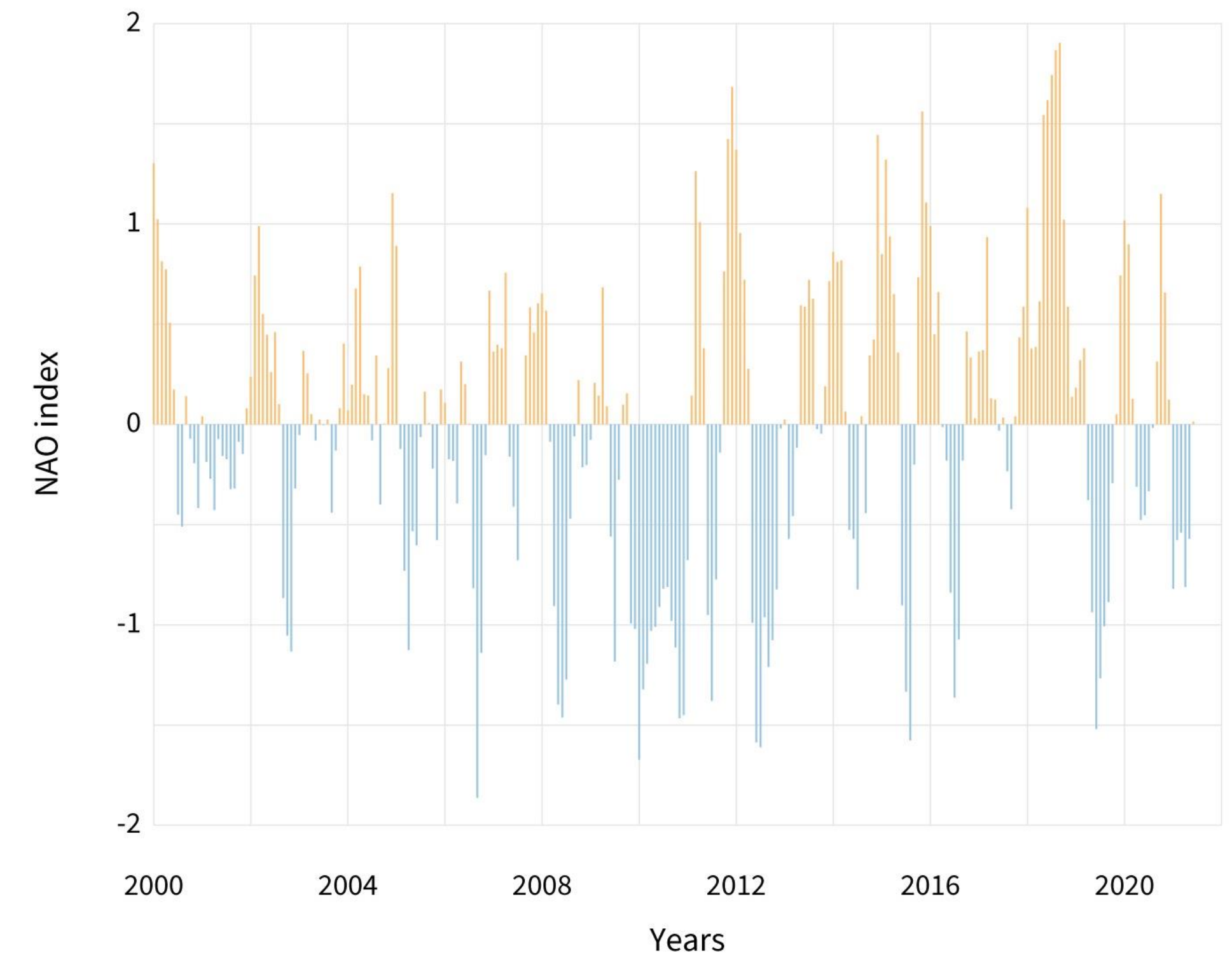
Positive Phase - Summer



Negative Phase - Winter



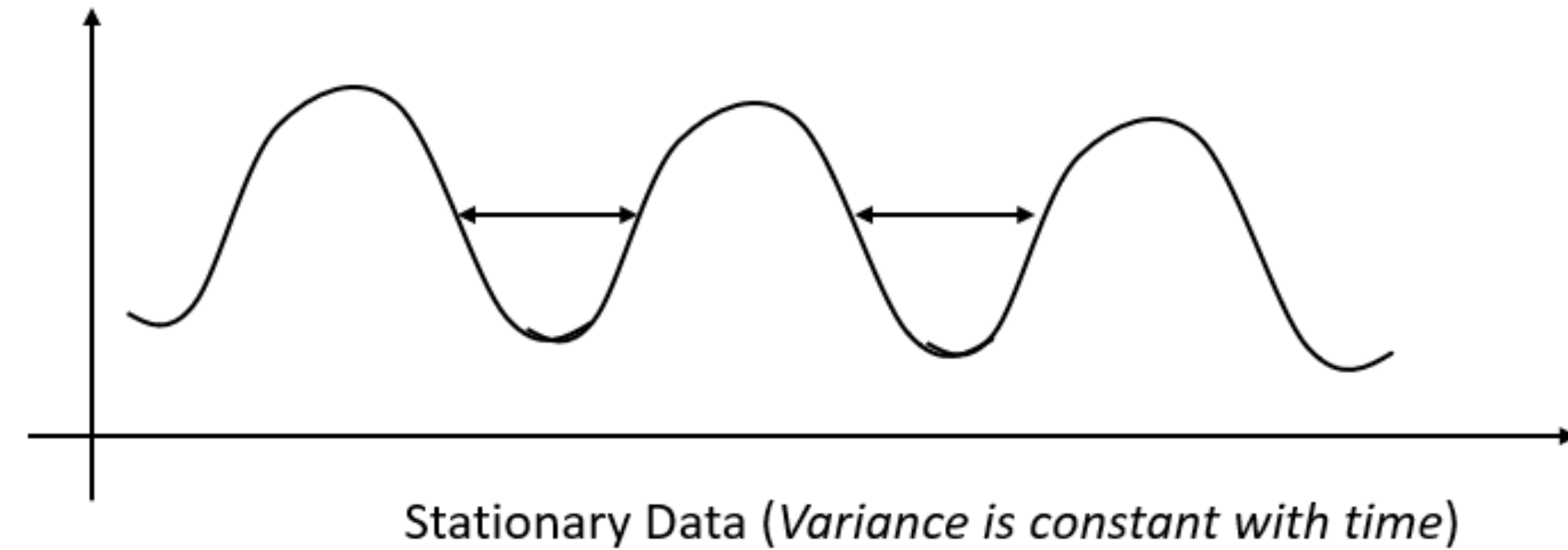
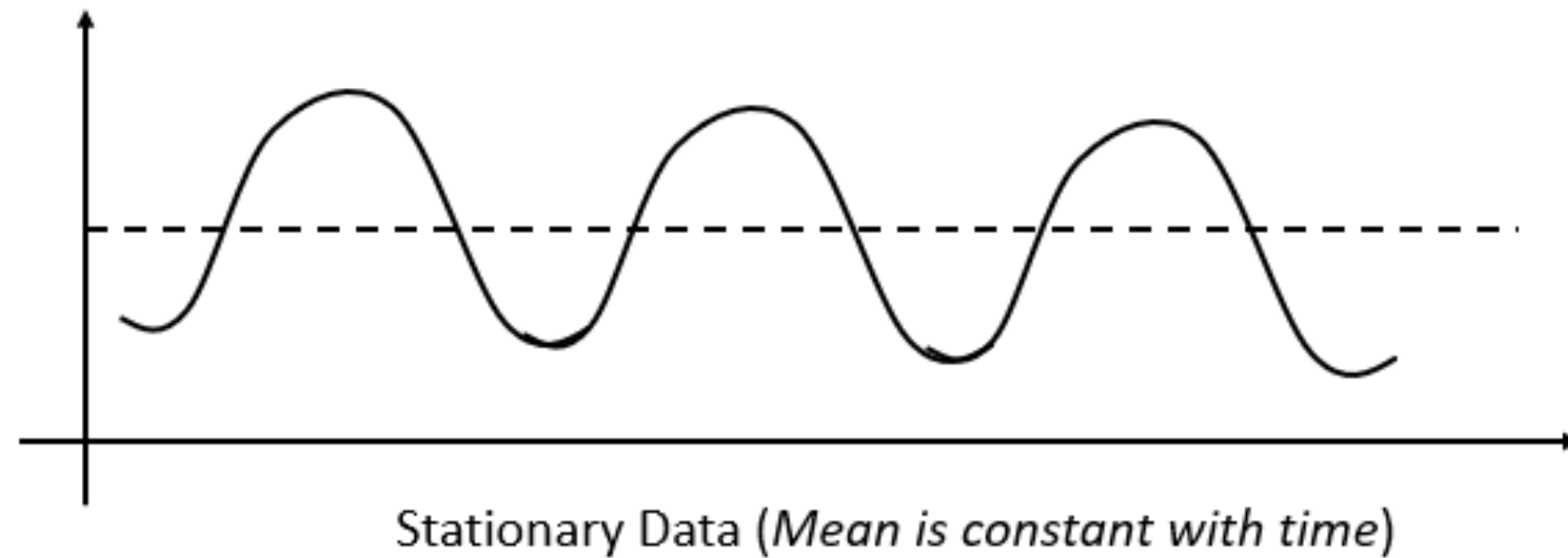
NAO positive and negative phases [1]



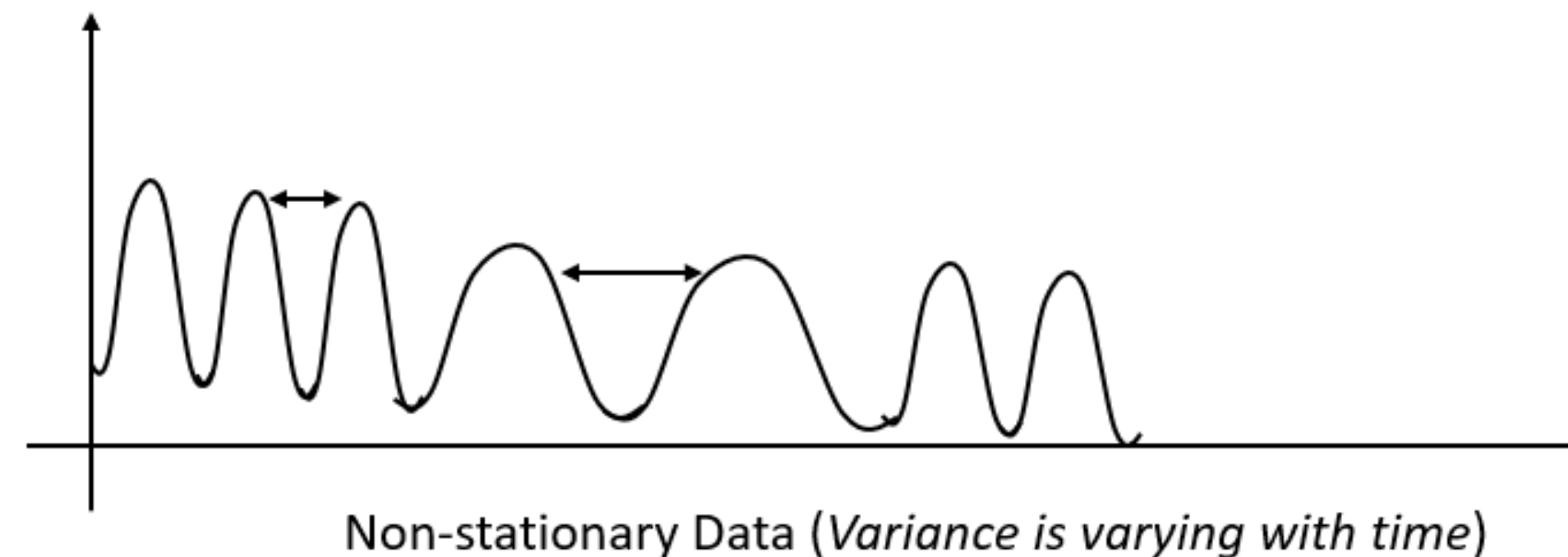
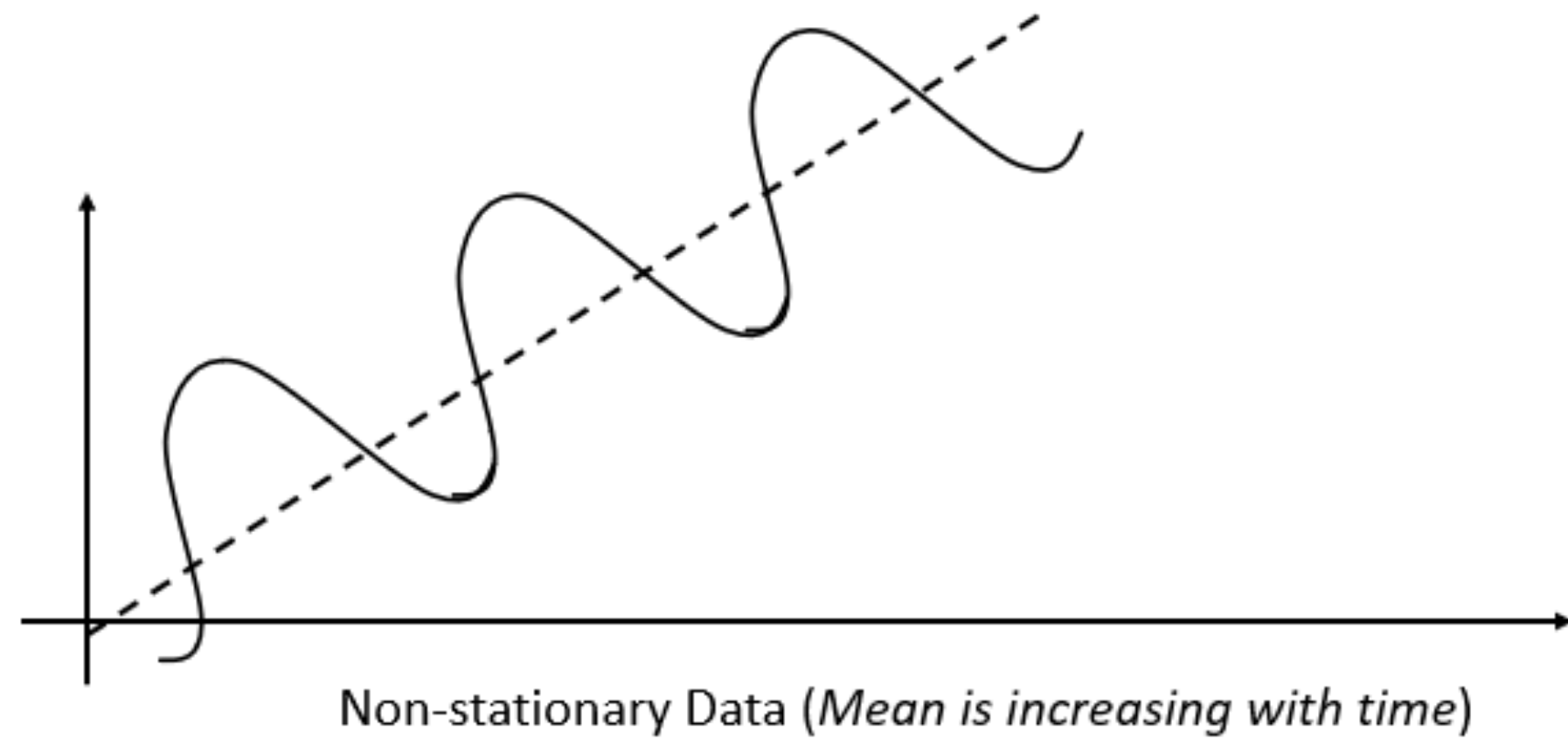
NAO Periodicity [1]

Hard vs Soft Periodicity

Hard (stationary) Periodicity : Mean and Variance are constant over cycle.



Soft (non-stationary) Periodicity : Mean or Variance are varying over cycle.



Figures: <https://medium.com/analytics-vidhya/time-series-analysis-stationarity-check-using-statistical-test-f106e9045370>

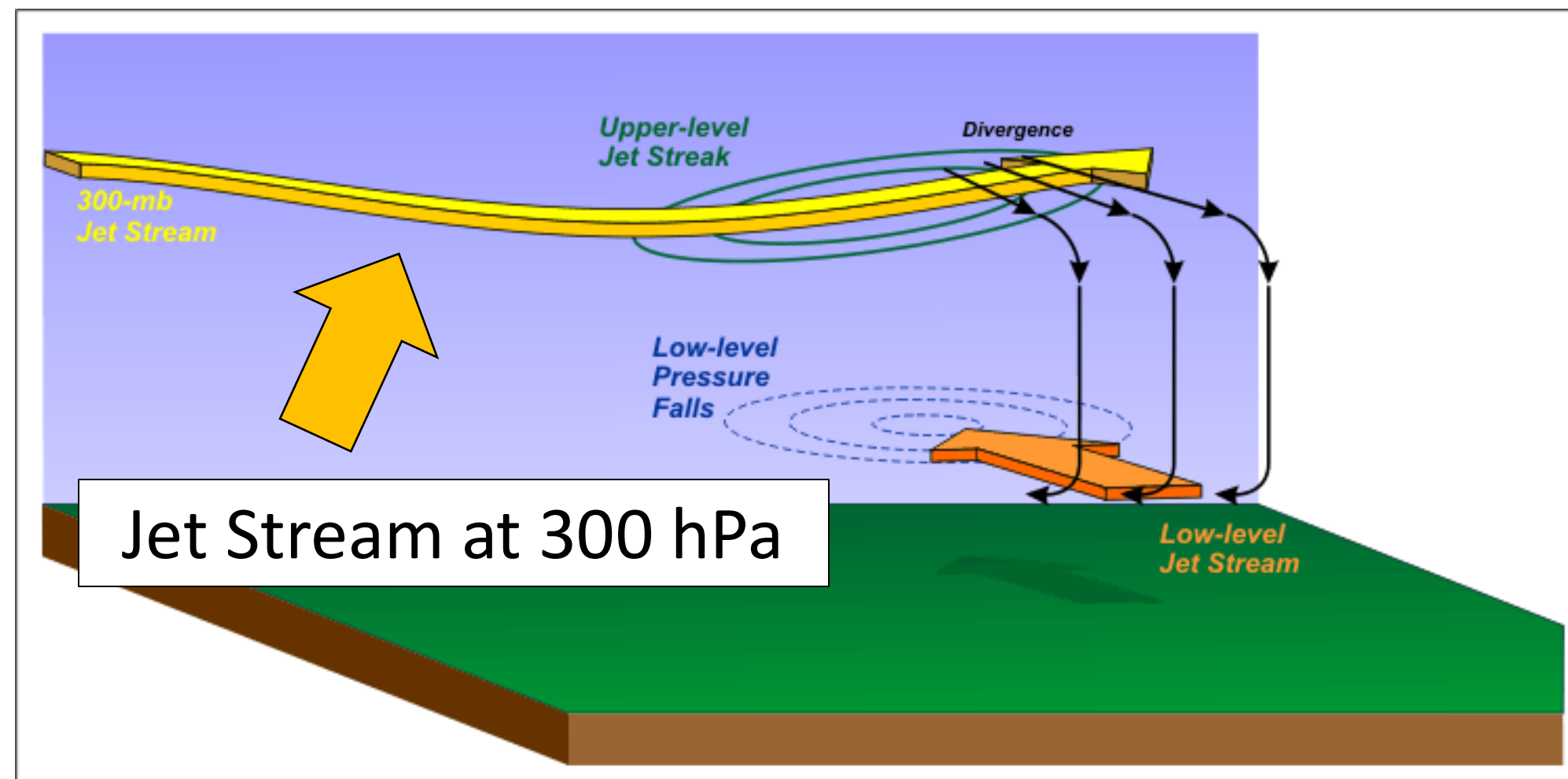
Soft Periodicity

Soft periodicity of spatiotemporal climate data is that the periodic change of mean or variance varies over the cycle.

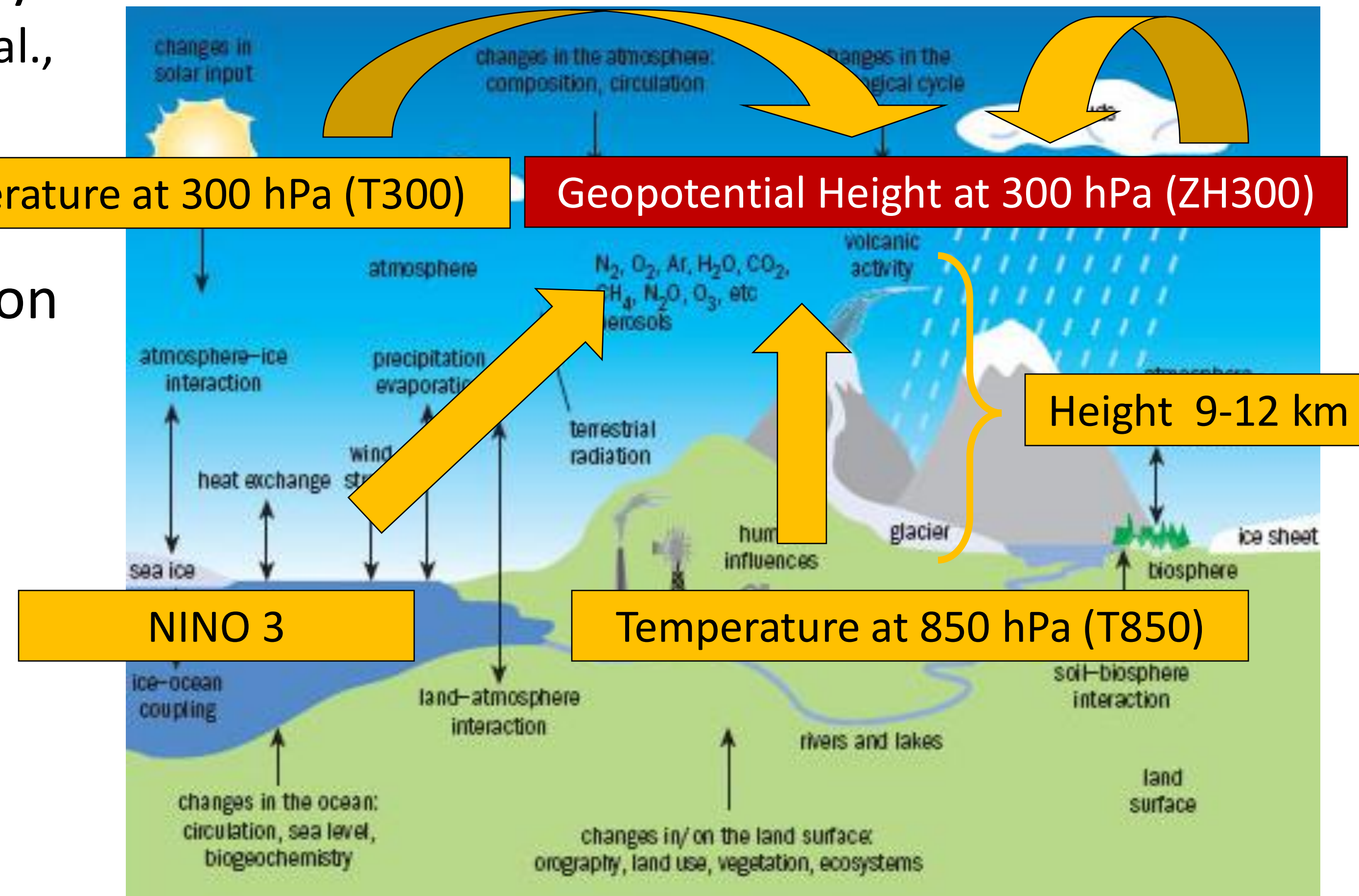
- A **climate shift** in seasonal values of meteorological and hydrological parameters for Northeastern Asia [Savelieva et al., 2000].
- The study of El Niño-Southern Oscillation (ENSO) effects [Kane, 2009] of some South African rainfall shows that the **periodic cycle range of rainfall may vary in many ranges of years.**
- The study of upstream sub-basins of Yangtze river [Ahmed et al., 2020] also shows a **statistically significant two to four-year periodicities** for mean areal precipitation.

Climate Prediction using Multivariate Features by ConvLSTM

- The utilization of multivariate features by **Convolutional LSTM (ConvLSTM)** [Shi et al., 2015] for climate prediction.
- Short- and long-term prediction.
- Investigating the importance of prediction features to predict ZH300.



Jet stream [1]



Global climate system [2]

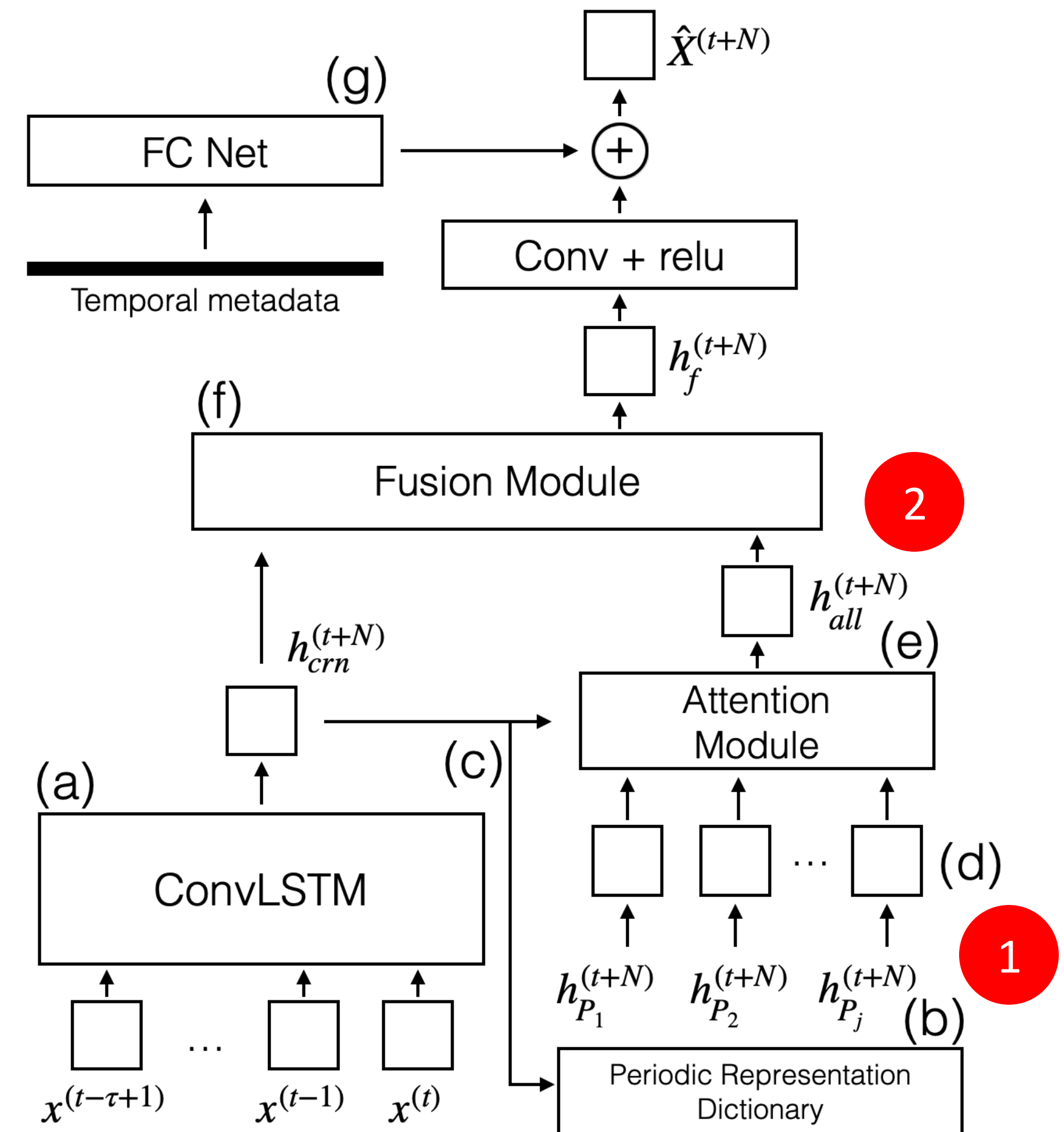
[1] https://www.weather.gov/source/zhu/ZHU_Training_Page/Miscellaneous/lowleveljet/lowleveljet.html

[2] <https://physicsworld.com/a/a-model-approach-to-climate-change/>

Soft Periodic Convolutional Recurrent Network (SP-CRN)

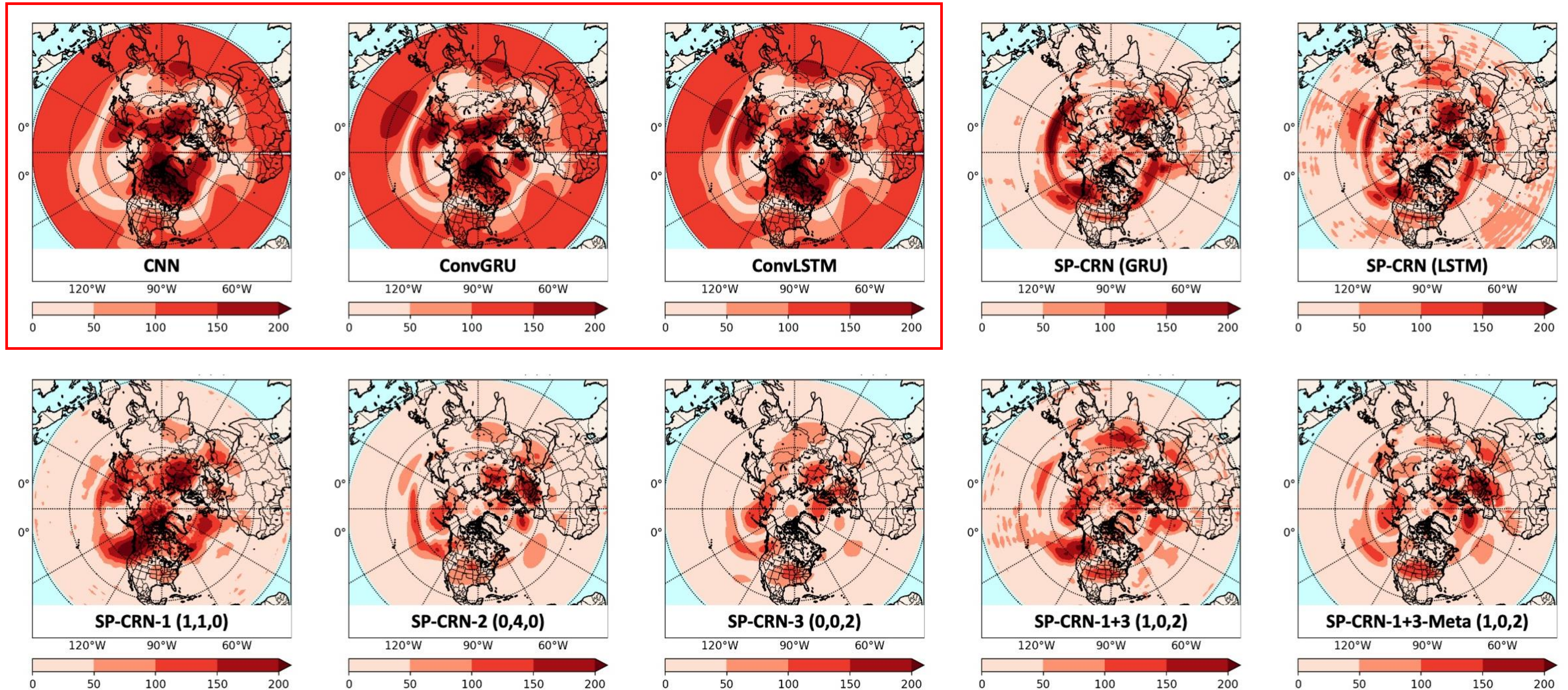
Periodic-CRN

- Stationary periodicity -> **Hard** periodicity
- We proposed SP-CRN
 1. **Soft** periodicity with three types of PRD [Phermphoonphiphat, 2021]
 - nearby-time (PRD-1)
 - periodic-depth (PRD-2)
 - periodic-depth-differencing (PRD-3)
 2. Dynamic spatial weight (DSW) on attention module



[ZH300] Error Distribution of **SSW** approach (February 2017)

No periodicity component



VEKINTM DeepTech for Sustainability

Found In 2010

Provide End-to-End Sustainability Ecosystem

Deep Tech Team

30+ with AI, ML, Blockchain Developer

TGO - VVB

CFO, CF-Event, T-VER, Premium T-VER

Certified Standards

ISO 9001:2015

ISO 14001:2015

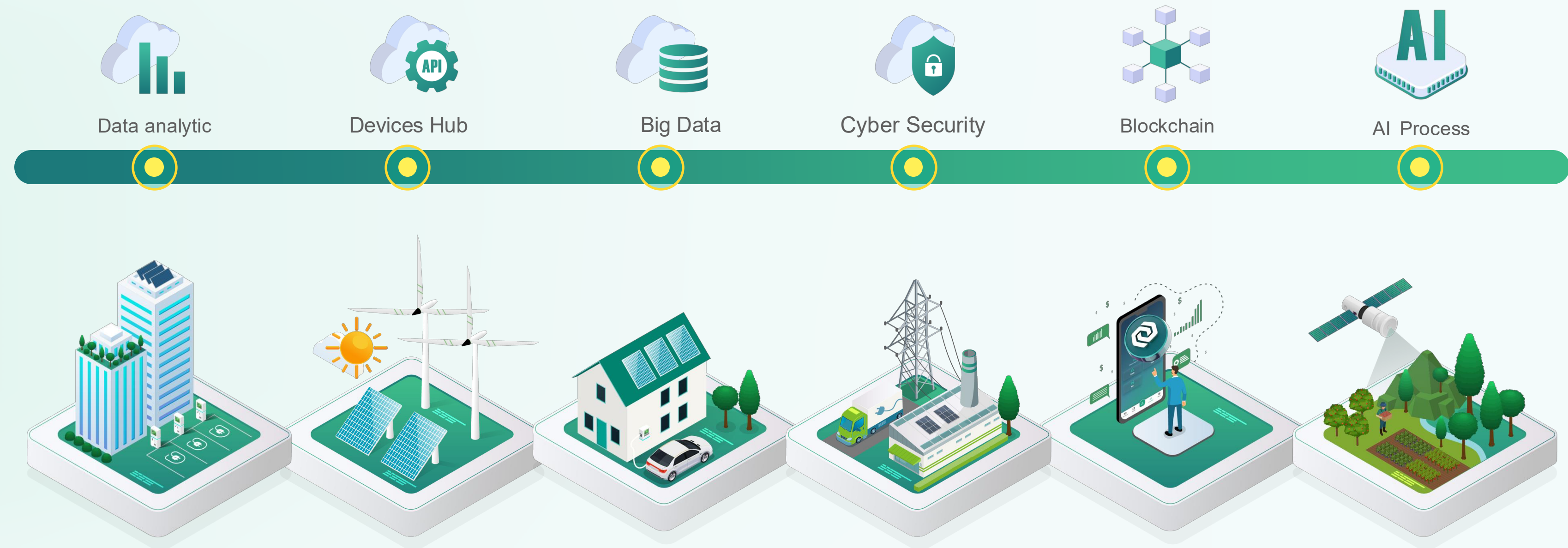
ISO 14065:2020

ISO 17029:2019

ISO 27001:2022

ISO 29110-1-1:2024

ISO 42001 : 2023



Recognized by



CO₂

CH₄

N₂O

HFCs

PFCs

SF₆

Scope 2
INDIRECT

Scope 1
DIRECT

Scope 3
INDIRECT

Scope 3
INDIRECT



purchased goods and services



capital goods



fuel and energy related activities



transportation and distribution



waste generated in operations



business travel



employee commuting



leased assets



company vehicles



company facilities



transportation and distribution



processing of sold products



use of sold products



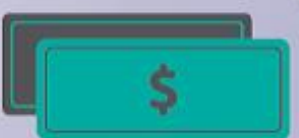
end-of-life treatment of sold products



leased assets



franchises



investments

Upstream activities

Reporting company

Downstream activities



CBAM

Carbon Border Adjustment Mechanism



AI Energy Auditor

Saving



Powered by

MEAEi x **VEKIN** TM



VEKIN

TM

AI CARBON AUDITOR

Disruptive Process Innovation

Traditional

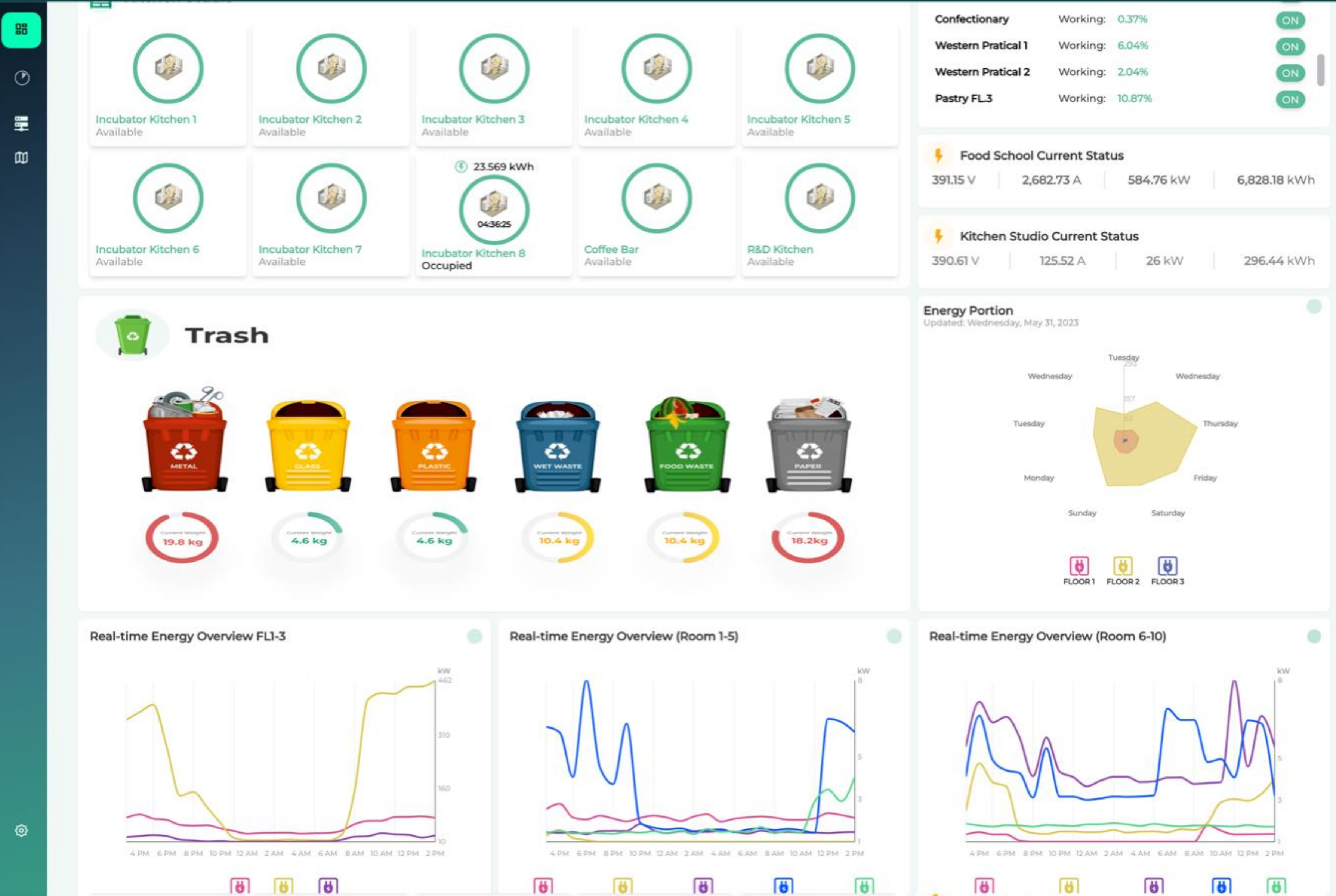


VS

AI



our platform works **10,000 times faster**
and **100,000 times cheaper** than
traditional process



Truck Capacity Available



 truck-001 (สย-123)
charging

Overview

History

Carbon



12-22-2023 Fri 13:45:54

BU_Cap_01

Location
13.7646770,100.5507510

Available Capacity
40%

Updated Time
22 Dec 2023, 13:46



12-21-2023 Thu 15:47:33

BU_Cap_01

Location
13.7643550,100.5511780

Available Capacity
80%

Updated Time
21 Dec 2023, 15:47

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Where can find us



89 AIA Capital Center, 8th Floor Ratchadapisek Road,
Din Daeng, Bangkok, Thailand



Building 3 North London Business ParkOakleigh
SouthLondon N11 1NP

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TH

Waiting for your Actions



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