February 2024

asking those who feel it

local and Indigenous knowledge (ILK) on climate change

Day 5 (21 February)

Jakob Steiner

Solmaz Mohadjer

Course content

13 February (0900 – 1300)

Pre course evaluation - general introduction and history – interactive team work – introduction to writing assignment

14 February (0900 – 1300)

Guest lecture Judith Marechal (Arctic) – Disaster Risk Reduction – interactive team work – integrating ILK with science

15 February (0900 – 1300)

Guest lecture Fozia Parveen (Karakoram) – International efforts to integrate ILK – Feedback session – deadline for writing assignment

20 February (0900 – 1300)

Guest lecture Tenzing Sherpa (Himalaya) – ILK governance and ethics – integrating ILK with conventional data

21 February (0900 – 1300)

Group presentations – self evaluation - recap

21 February / Day 4

Wednesday (Feb 21)

Welcome to our last session 😝

Learning Objectives: Condense your knowledge on a topic, apply it to a case study and present it in a short period of time! Follow others' presentations and internalize best practices.

Roadmap for today:

- 9:00-9:30 Pairing scientific data with ILK (Part II)
- 9:30-12:15 Group presentations (with a short break in between)
- 12:15-12:40 Recap of the course
- 12:40-13:00 Post-course evaluation

Integrating ILK and science – Sub Saharan Africa

Indigenous and local knowledge especially revolving around forecasting of rain

Regional climate outlook forums (COFs) exist across countries

Need for scientific backup under rapidly changing climate

- Coordination of formal and informal institutions around a central task
- Building communication structures to support forecast dissemination
- Educating the public about forecasts and climate risk
- Better management of seasonal climate variability risk
- Empowering rural communities through participation in forecasting workshops

Mafongoya et al. 2017

Table 1: Indigenous indicators for weather and climate in SSA – tree phenology

Indicator	Country	Significance	Reference
Onset of the rains			
Flowering of the peach tree (*Prunus persica*), apricot (*Prunus armeniaca*), budding of acacia species	Botswana Zimbabwe South Africa Tanzania Mali Nigeria	Beginning of rainy season	Kolawole *et al.*, 2014; Risiro et al., 2012; Mapfumo *et al.*, 2015; Zuma-Netshiukhwi *et al.*, 2013; Kangalawe *et al.*, 2011; Elia *et al.*, 2014; Kiptot, 2007;
Flowering coffee, delonix (*Christmas*) and mango trees; and other trees	Uganda Tanzania Kenya Burkina Faso	Rains are not far	Orlove *et al.*, 2010; Kangalawe *et al.*, 2011; Elia *et al.* 2014; Roudier *et al.*, 2012; Roncoli *et al.*, 2002;
Season quality			
Behaviour of certain plants: sprouting of Aloe ferox; germination of new leaves on baobab and tamarind trees	Ethiopia South Africa Zimbabwe Zambia Burkina Faso	Indication of good rains	Saitabau 2014; Speranza *et al.*, 2009; Zuma-Netshiukhwi *et al.*, 2013;
Mango tree (*Mangifera indica*)	Tanzania Zimbabwe Burkina Faso	Heavy flowering of the mango trees indicates a potential drought season	Kijazi *et al.*, 2013; Elia *et al.*, 2014; Roncoli *et al.*, 2002;
Muchakata tree (*Parinari curatellifolia*), gan'acha tree (*Lannea discolor*), mushuku tree (*Uapaca kirkiana*)	Zimbabwe Mali Nigeria	Heavy flowering of the trees indicates a potential drought season	Muguti and Maposa, 2012; Risiro *et al.*, 2012;
Dormancy breaking in certain trees species e.g. mupfuti (*Brachystegia boehmii*)	Zimbabwe	Indicates plenty of rain in a few days	Muguti and Maposa, 2012;
Profuse fruiting of certain tree species	Burkina Faso Ethiopia Kenya Nigeria	More fruiting of certain trees indicates a challenging rainy season ahead	Roncoli *et al.*, 2002; Kiptot, 2007; Davis, 2010;

Sub Saharan Africa

Mafongoya et al. 2017

Table 3: Indigenous indicators for weather and climate in SSA – animal behaviour

Indicator	Country	Significance	Reference
Onset of the rains			
Appearance of red ants, rapidly increasing size of anthills	South Africa Zimbabwe	Good rains are coming	Zuma-Netshiukhwi *et al.*, 2013; Risiro *et al.*, 2012;
First appearance of sparrows; flock of swallows preceding dark clouds	South Africa Tanzania Uganda Zimbabwe Nigeria Mali	Rain is at hand and farmers should prepare for above normal rains	Orlove *et al.*, 2010; Kangalawe *et al.*, 2011; Elia *et al.* 2014; Roudier *et al.*, 2012; Roncoli *et al.*, 2002;
Appearance of certain birds e.g. stock Singing, nesting and chirping of certain birds	Uganda Tanzania Zimbabwe Burkina Faso Botswana Nigeria Mali Ethiopia	Rain is at hand and farmers should prepare for above normal rains	Kangalawe *et al.*, 2011; Orlove *et al.*, 2010; Elia *et al.*, 2014; Okonya *et al.*, 2013; Muguti and Maposa, 2012; Risiro *et al.*, 2012; Roncoli *et al.*, 2003; Roudier, 2012; Kolawole *et al.*, 2014;
Termite appearance (*Ancistrotermes spp*)	Tanzania Uganda Zimbabwe	Appearance of many termites indicate near rainfall onset	Kijazi et al., 2013; Elia et al., 2014; Okonya *et al.*, 2013; Muguti and Maposa, 2012;
Bee eater (*Merops hirundineus*)	Tanzania Nigeria Mali Botswana	Appearance in October indicate imminent rainfall and/or onset	Kijazi *et al.*, 2013; Elia *et al.*, 2014;
Frogs in swampy areas croaking at night	Uganda Zimbabwe	Indicator for onset of rains	Okonya *et al.*, 2013; Muguti and Maposa, 2012;
Rock rabbit	Zimbabwe	Its unusual squeaking indicates imminent rainfall	Muguti and Maposa, 2012; Risiro *et al.*, 2012;
Cicadas (nyenze), day flying chafers (mandere), dragon flies (mikonikoni)	Zimbabwe	Appearance of these signifies imminent rainfall	Muguti and Maposa, 2012; Risiro *et al.*, 2012;
Season quality			
Grunting pigs indicate low humidity	South Africa	Rains are near	Zuma-Netshiukhwi *et al.*, 2013;
Calves jumping happily	Uganda South Africa	Good rain season	Okonya *et al.*, 2013; Zuma-Netshiukhwi *et al.*, 2013;

Sub Saharan Africa

Table 5: Complementarity between science and traditional seasonal climate forecasts (adapted from Moller *et al.*, 2004)

Principle	Explanation
Diachronic vs systematic complementarity	Science collects dynamic data in a time series over a large area e.g. the use of COFs in Africa. IKS focus on diachronic data and long term series' in small areas e.g. the use of indigenous indicators of forecasting in African villages or districts.
Focus on averages vs extremes	Science is based on the numerical data analysis of averages. IKS observe extreme weather events and unusual patterns, which is critical in climate change adaptation.
Quantitative vs qualitative information	Science demands quantitative data. IKS demand qualitative understanding of the system. Understanding complex systems like climate change requires both. Qualitative measures are rapid and inexpensive but they lack precision.
Hypothesis vs mechanisms	IKS rely on hypotheses for problem solving. Science has powerful tools to explain the reasons for mechanisms. The use of both IKS and science takes advantage of their relative strengths.
Objectivity vs subjectivity	Science is objective and excludes people's feelings. IKS include people's feelings, relationships and sacredness. The combination of both methods produces science with a heart.

Mafongoya et al. 2017

Climate knowledge reflected in language

Take aways for scientific knowledge from available local knowledge

Granularity of information not provided in scientific knowledge (e.g. value, quality, timing of rainfall)

No link between knowledge and responsibility in scientific knowledge

Roncoli et al. 2002

TABLE 2 Typology of Rainfall Events

sa kenga
Big rain. Refers to amount, duration, or distribution.

sa serdem
Fine rain, lasting several hours. Causes good infiltration

sigri saaga (*sig saaga*)
Planting rain, rain that marks onset of rainy season.
Lasts the whole night: 6–8 hours.
Steady precipitation, not violent, without wind or thunder.
Leaves soil moist for several (5+) days.

sa sika
Very localized, with one or few clouds.
Without wind or cool temperatures.
Can fall any time of day, but mostly in August.

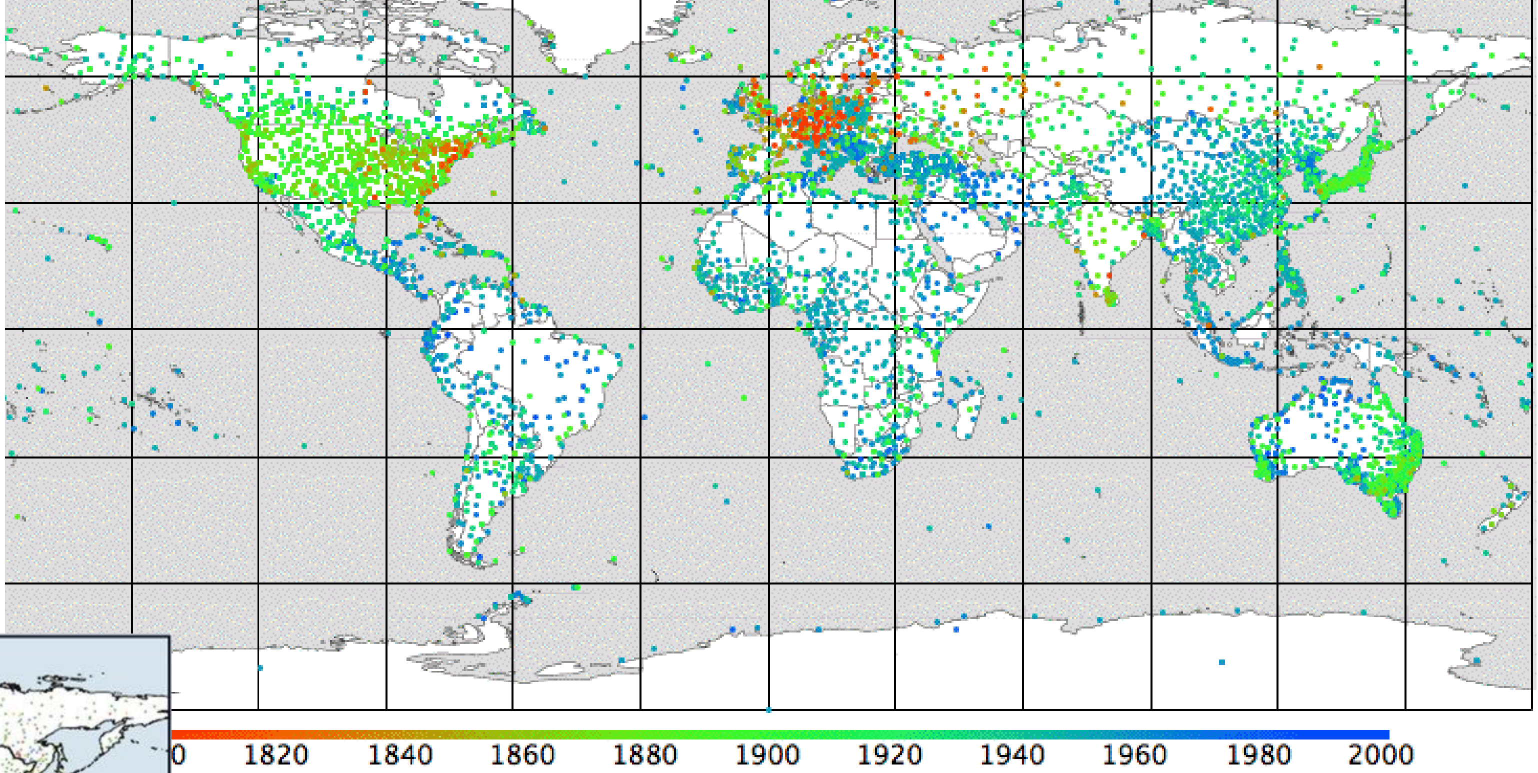
sa nyanga
Abundant precipitation, mostly mornings or evenings.
Lasts several hours.
Accompanied by gentle thundering.
Leaves soil soaked, good infiltration, moisture lasts long time.
Characterizes favorable rainy season and predicts good harvest.
Mostly in July–August, but increasingly rare in recent years.

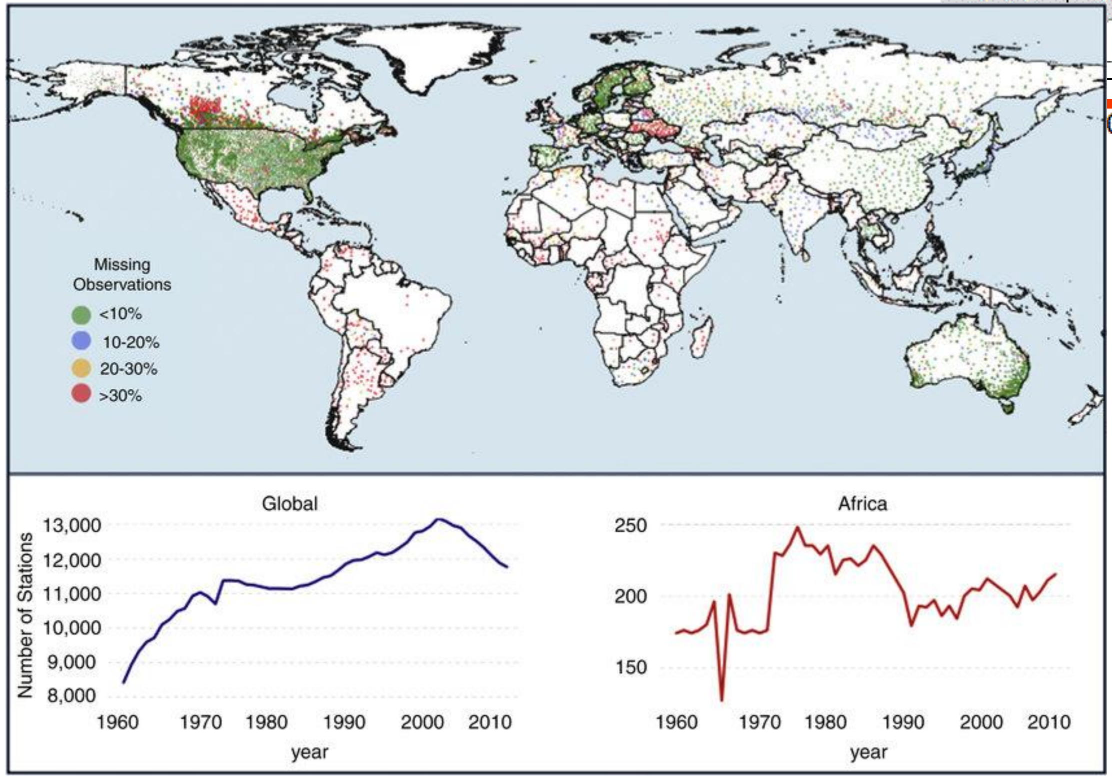
saraogo
Short but violent downpour, usually early morning or at sunset.
Localized or oddly distributed.
Accompanied by heavy wind, sharp thunder, and lightning.
Damages animals, people, dwellings, crops.
Believed to be invoked or attracted.
Characterizes unfavorable rainy seasons and predicts poor harvest.
Mostly in July–August, increasing frequency in recent years.

bind saaga
Literally "excrement rain" because it washes dried excrement off plants in the bush.
Also called "mango rains" because it washes mango fruits.
Early rains in April.
Abundant in the past, used to fill stream beds.
Enables people to use mud to repair walls.
Stimulates growth of young fibers of roofing grass or *baganá* (*Philostigma* sp.).

Rainfall data

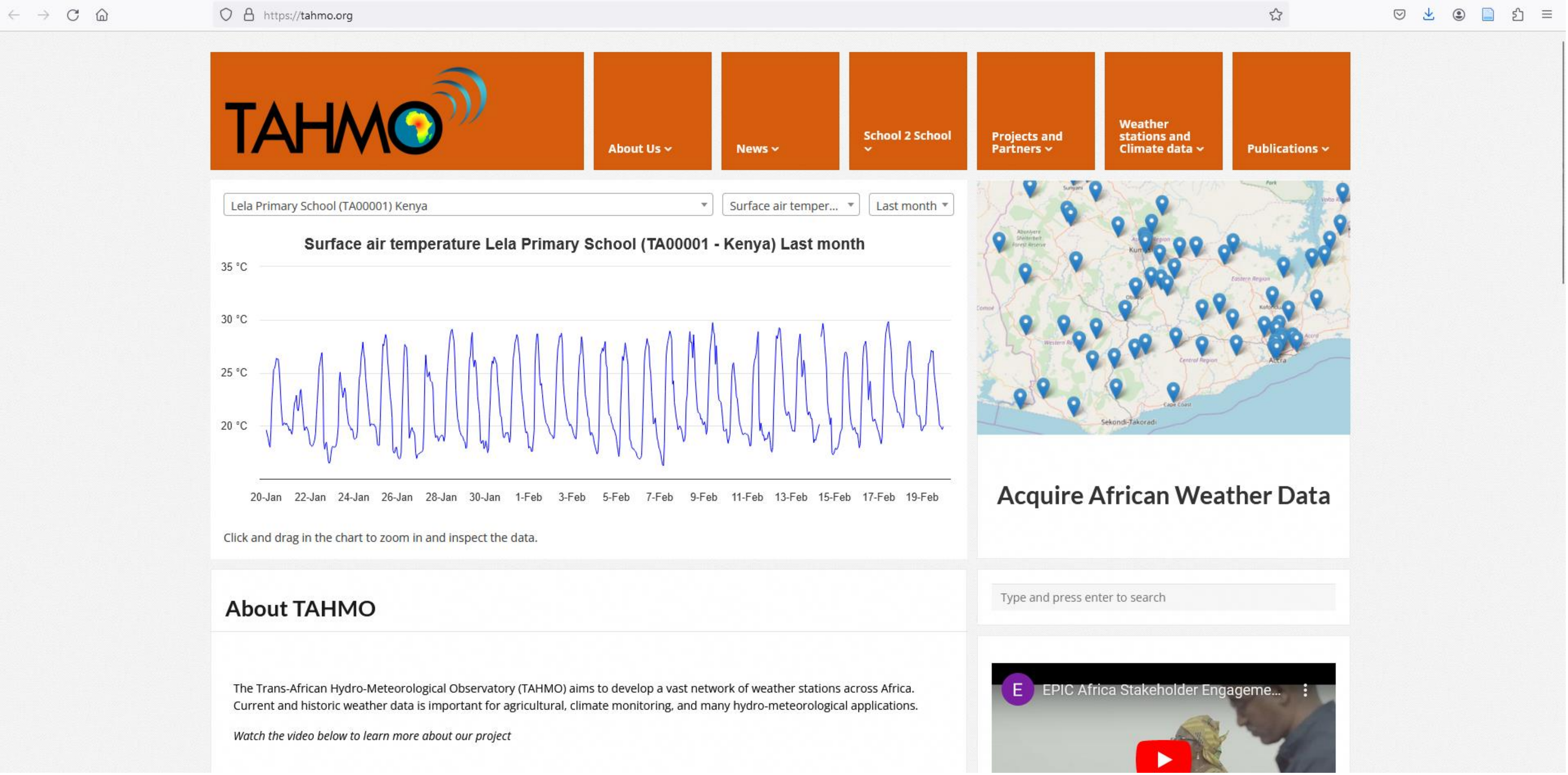
WMO / GHCNd network





Heft Neal et al. 2017

Filling the gap with citizen science



NON-TRADITIONAL WATER MONITORING THROUGH LOCAL INVOLVEMENT

Generate, manage and exchange key water data and knowledge through
local involvement for sustainable and effective water outcomes
in the developing context

Citizen Science Nepal

https://smartphones4water.org/about/

Mustang, Nepal
October 2023

Astronomical forecasting

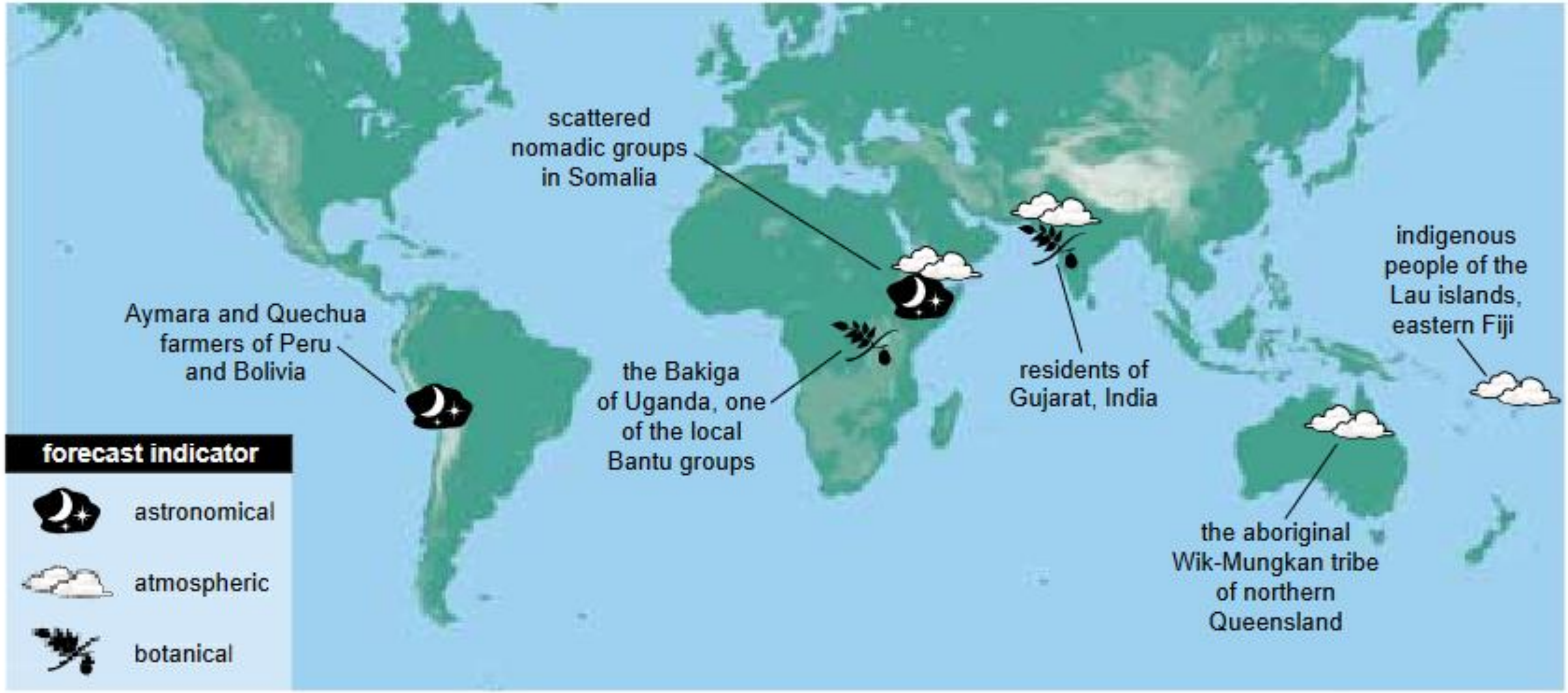
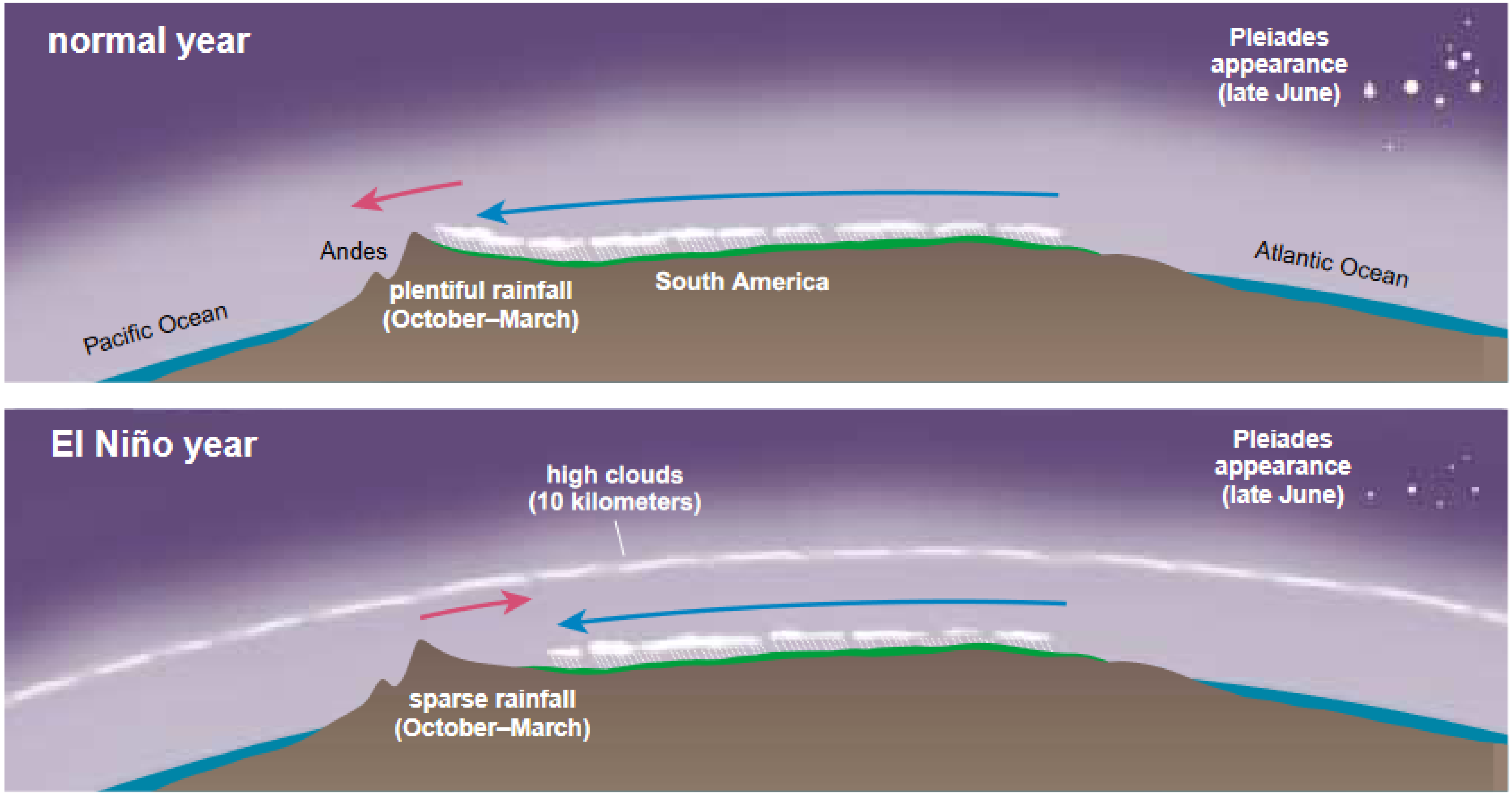


Figure 9. Local and indigenous groups in several parts of the world attempt to forecast climate conditions using simple observations of their environment. Those instances depicted here have recently come to the attention of the authors, who are assembling information about such practices worldwide. Curiously, such predictive schemes appear to be most common in tropical latitudes. Where other examples exist and how much such folk wisdom can be counted on remain open questions. In any event, these forecasts demonstrate which aspects of the climate their practitioners hope to discern and when reliable predictions would be of value to them.

Orlove et al. 2002

Astronomical forecasting (Andes)



Orlove et al. 2002

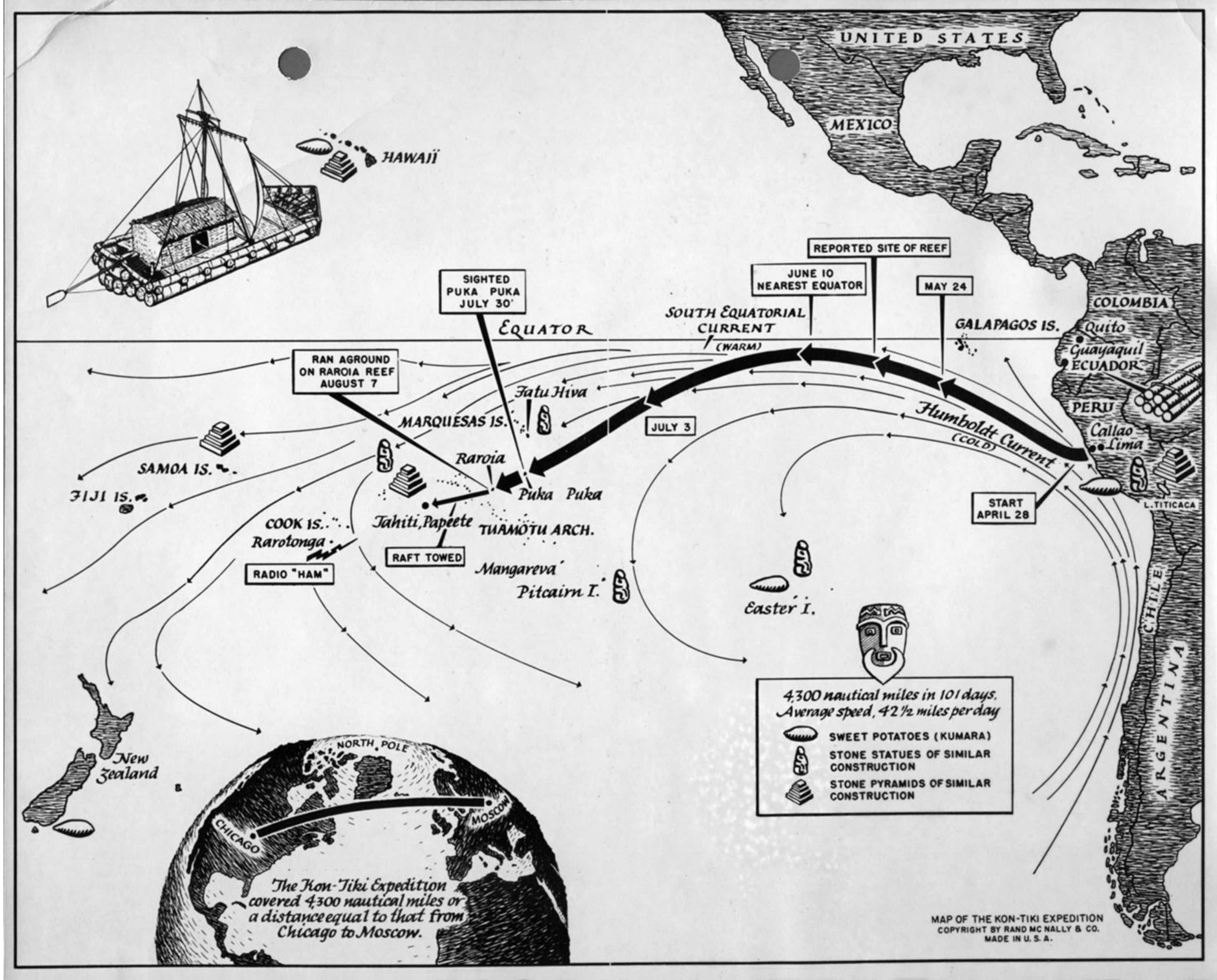
Figure 6. Although the high-level summer winds passing over the Andes are variable, in a normal year *(top panel)* this flow is, on average, from east to west *(red arrow)*. These winds thus help to bring some of the moist air moving west from the northern Amazon basin and then south along the flanks of the mountain chain *(blue arrow)* up into the Andes proper. El Niño causes the high-level summer winds to blow, on average, from west to east, which inhibits the import of this humid air and creates a markedly drier season for the farmers of the region *(bottom panel)*. They are, however, able to forecast the amount of rain to expect during the summer using the midwinter appearance of the Pleiades as a guide: Because El Niño also creates an obscuring layer of thin, high cloud over much of the tropics, the Pleiades appear dimmer when dry conditions are in store.

Thor Heyerdhal's Kon Tiki

Failed attempt to disprove population of Pacific islands from Asia

Assumption that local knowledge could not explain ocean currents

Assumption that navigation needs to be based on maps



Literature

Mafongoya, P.L. et al. (2017): Chapter 3: Using indigenous knowledge for seasonal quality prediction in managing climate risk in sub-Saharan Africa. https://publications.cta.int/media/publications/downloads/2009_PDF.pdf

Orlove, B.S., Chiang, S., John, C.H. and Cane, M.A. 2002. 'Ethnoclimatology in the Andes.' American Scientist 90: 428–435.

Roncoli, C., Ingram, K. and Kirshen, P. 2002. 'Reading the rains: Local knowledge and rainfall forecasting in Burkina Faso.' Society and Nature Research 15: 409.


Thank you