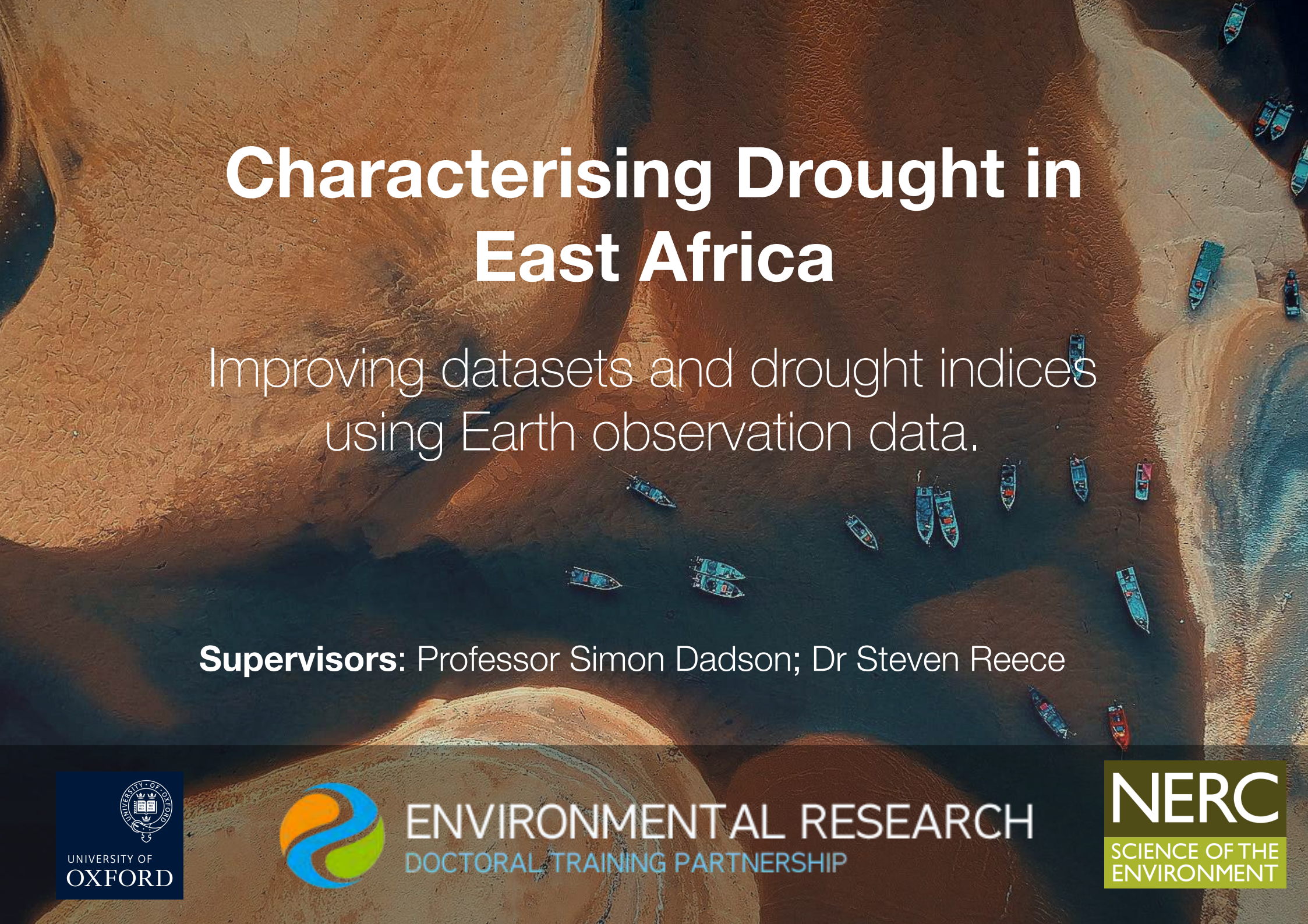

# Characterising Drought in East Africa

## Improving datasets and drought indices using Earth observation data.

**Supervisors:** Professor Simon Dadson; Dr Steven Reece

UNIVERSITY OF OXFORD

ENVIRONMENTAL RESEARCH
DOCTORAL TRAINING PARTNERSHIP

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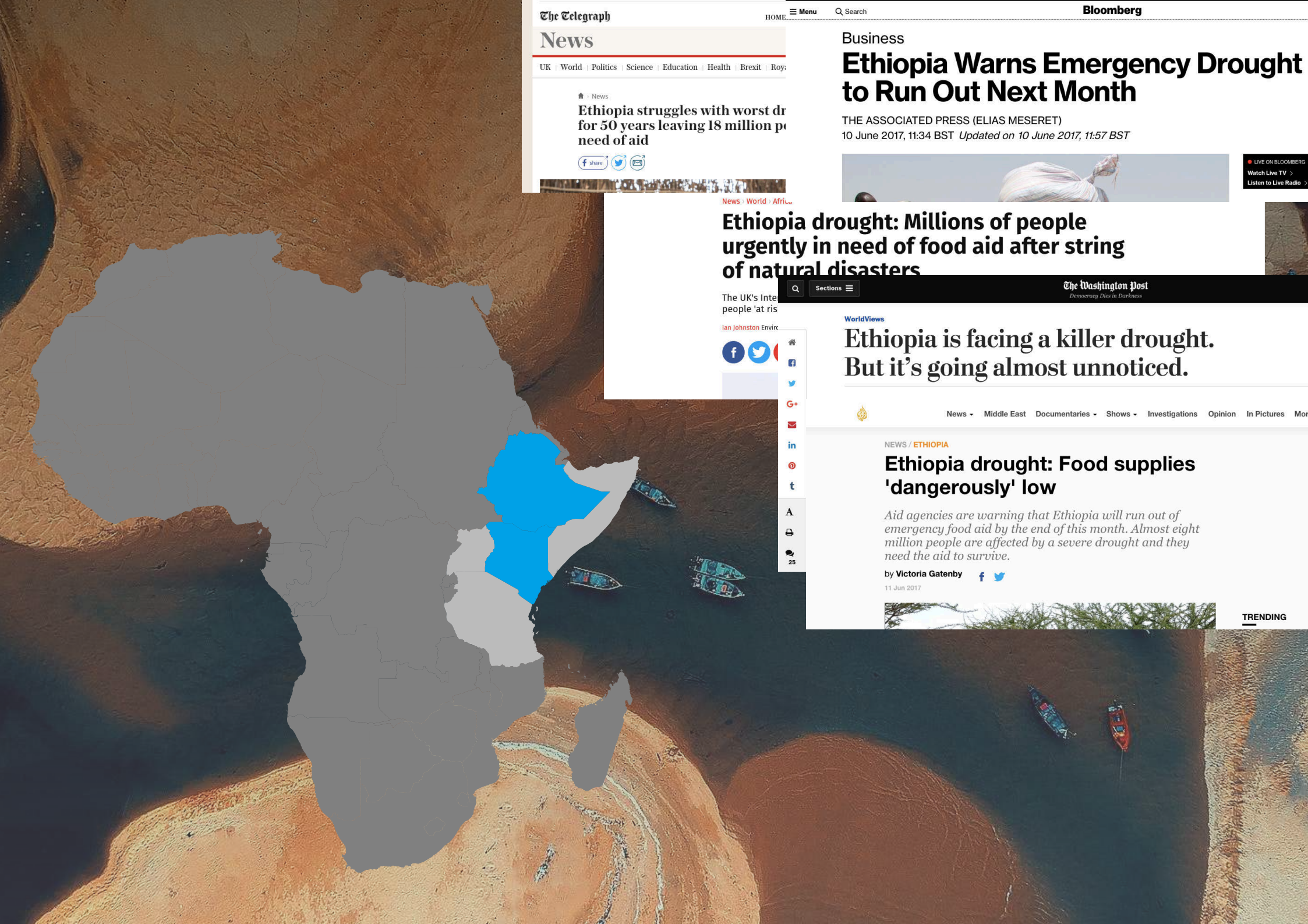

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# Ethiopia Warns Emergency Drought to Run Out Next Month

THE ASSOCIATED PRESS (ELIAS MESERET)

10 June 2017, 11:34 BST *Updated on 10 June 2017, 11:57 BST*

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# Ethiopia drought: Millions of people urgently in need of food aid after string of natural disasters

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# Ethiopia is facing a killer drought. But it's going almost unnoticed.

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NEWS / ETHIOPIA

# Ethiopia drought: Food supplies 'dangerously' low

*Aid agencies are warning that Ethiopia will run out of emergency food aid by the end of this month. Almost eight million people are affected by a severe drought and they need the aid to survive.*

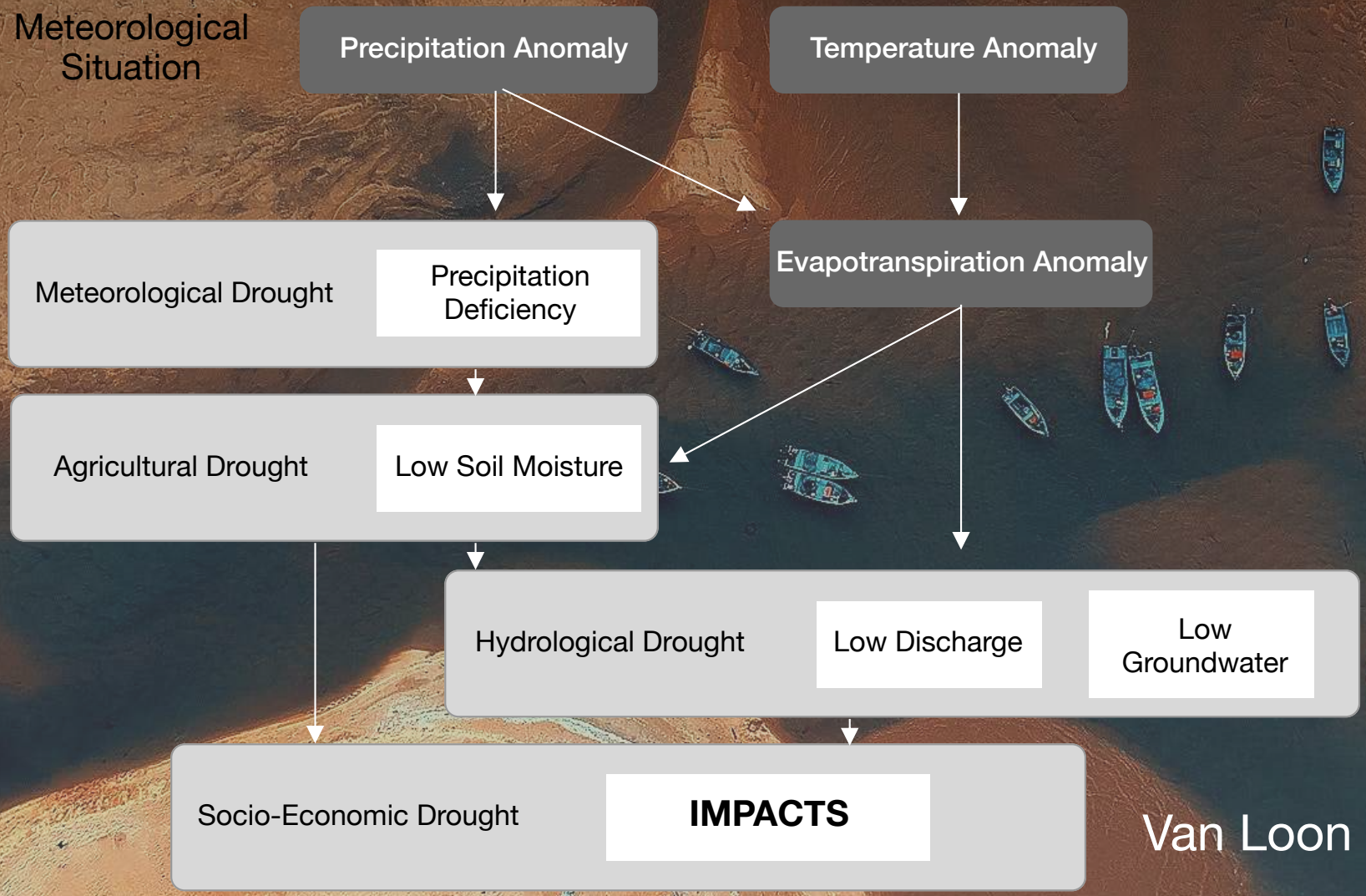
by **Victoria Gatenby**

11 Jun 2017

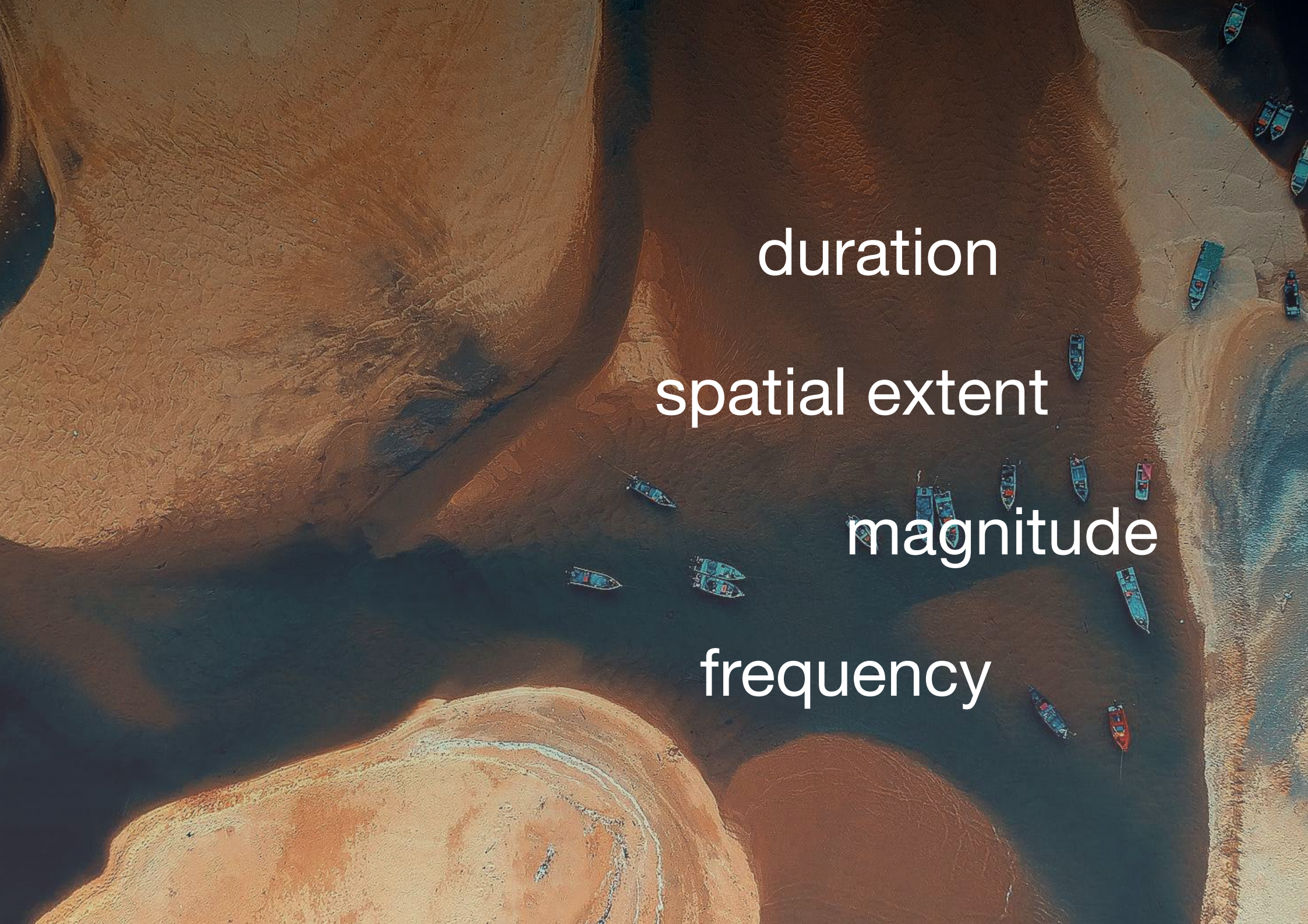
TRENDING

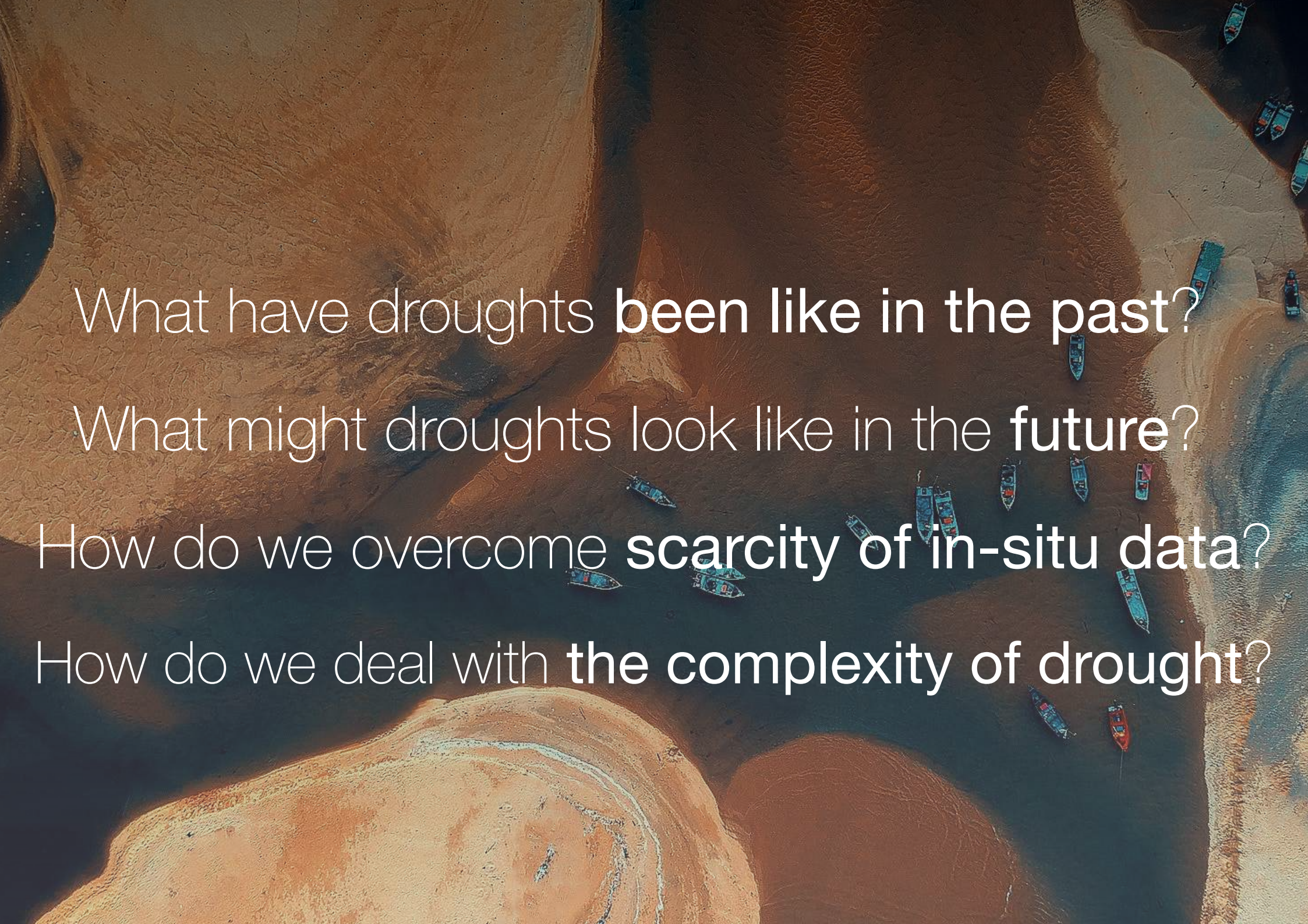
# *"the creeping disaster"*

Sheffield and Wood (2011)

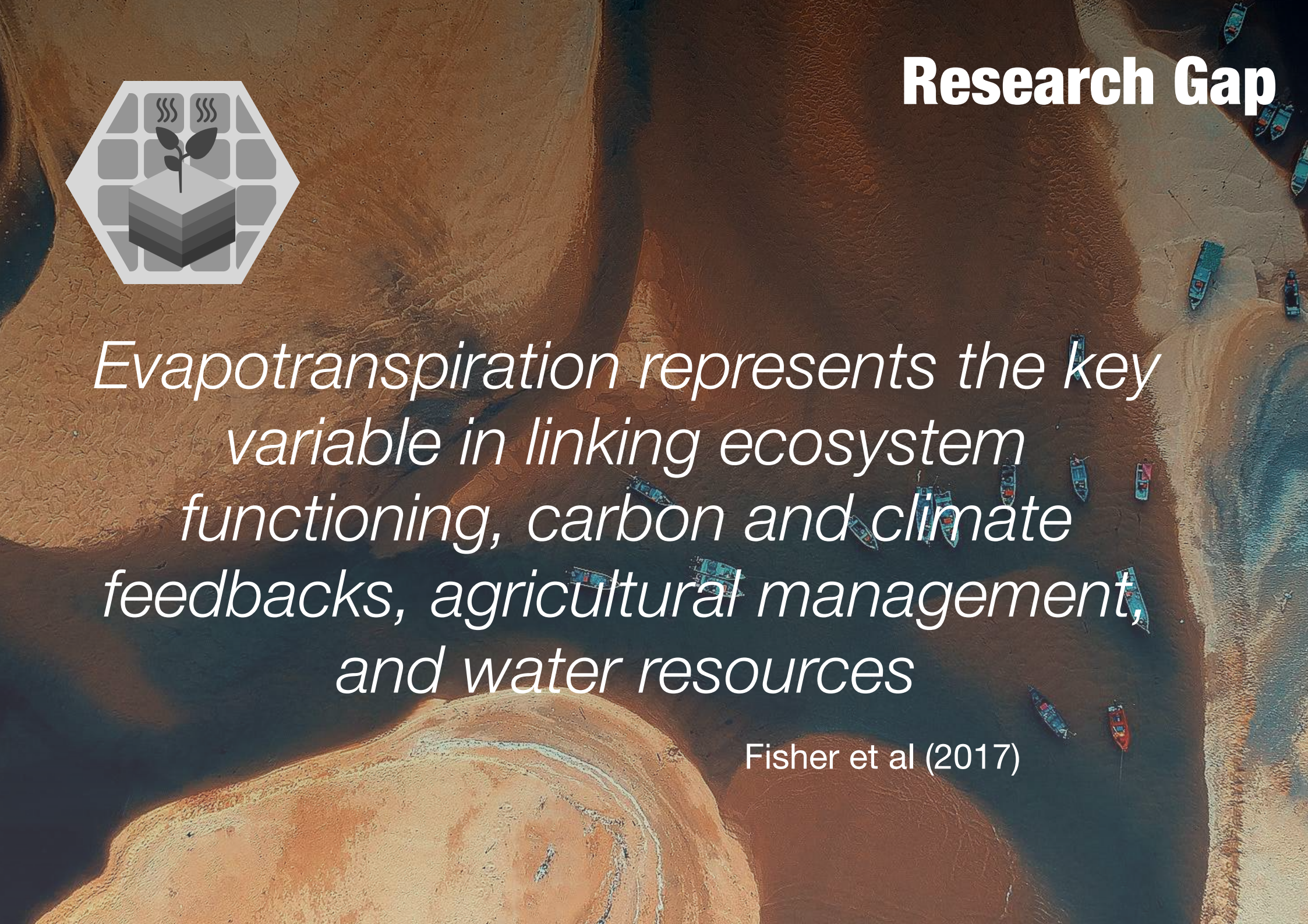



Van Loon (2015)


duration
spatial extent
magnitude
frequency


What have droughts been like in the past?
What might droughts look like in the future?
How do we overcome scarcity of in-situ data?
How do we deal with the complexity of drought?

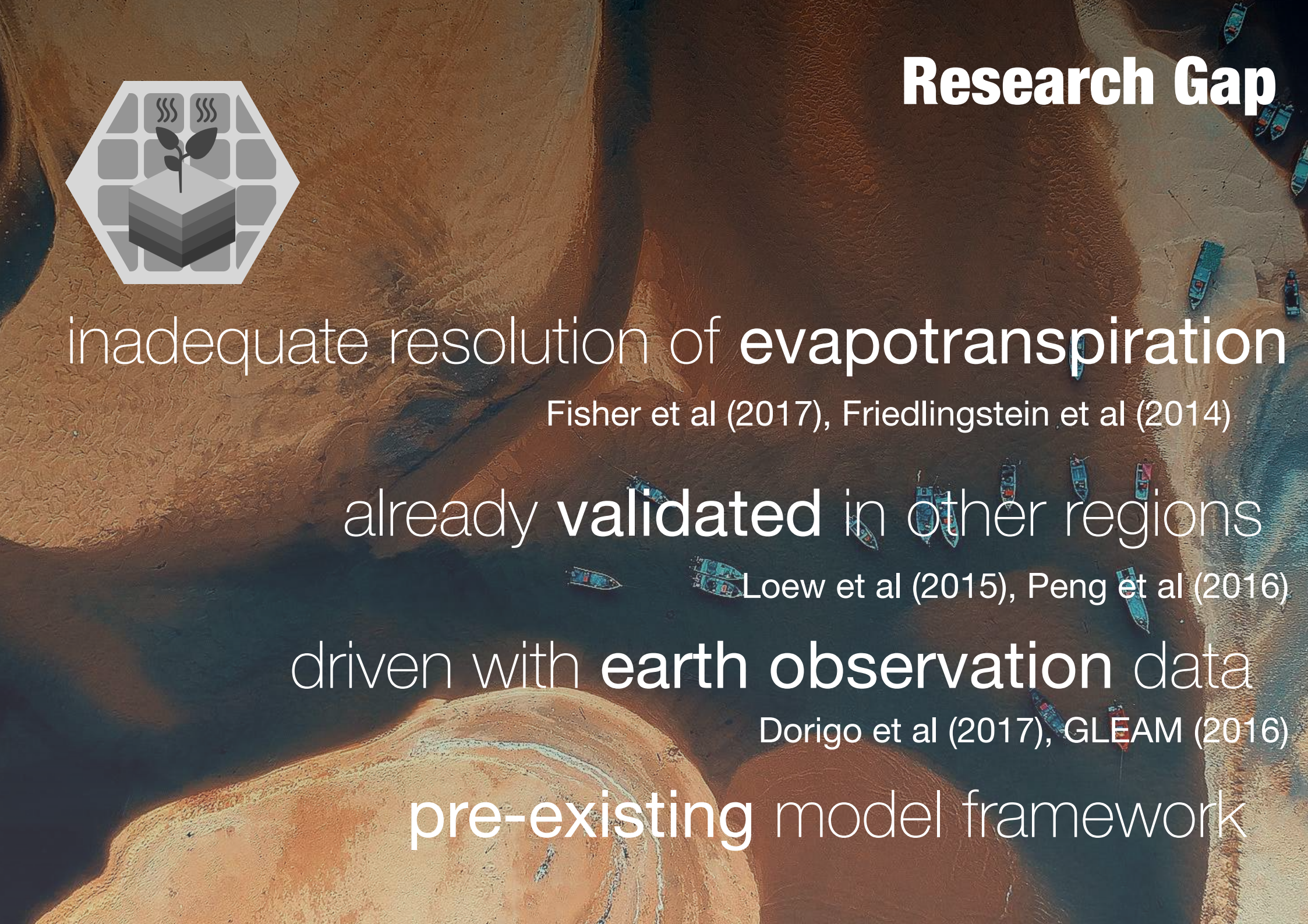
High Resolution evapotranspiration data product
Consecutive drought days as a new framework for drought monitoring
Improved Soil Moisture estimates in East Africa
Quantified impact of drought on crop yield



# Research Gap

*Evapotranspiration represents the key variable in linking ecosystem functioning, carbon and climate feedbacks, agricultural management, and water resources*

Fisher et al (2017)



# Research Gap

inadequate resolution of **evapotranspiration**

Fisher et al (2017), Friedlingstein et al (2014)

already **validated** in other regions

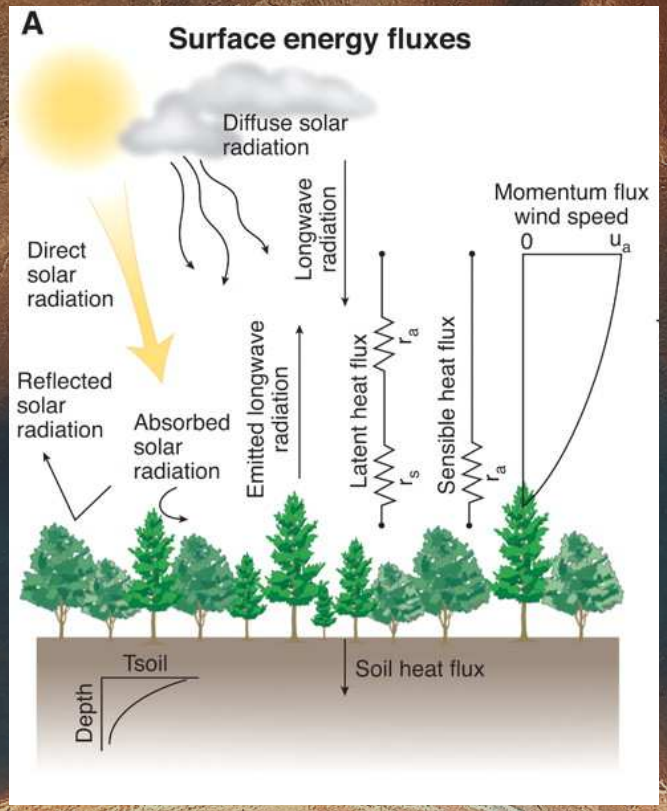
Loew et al (2015), Peng et al (2016)

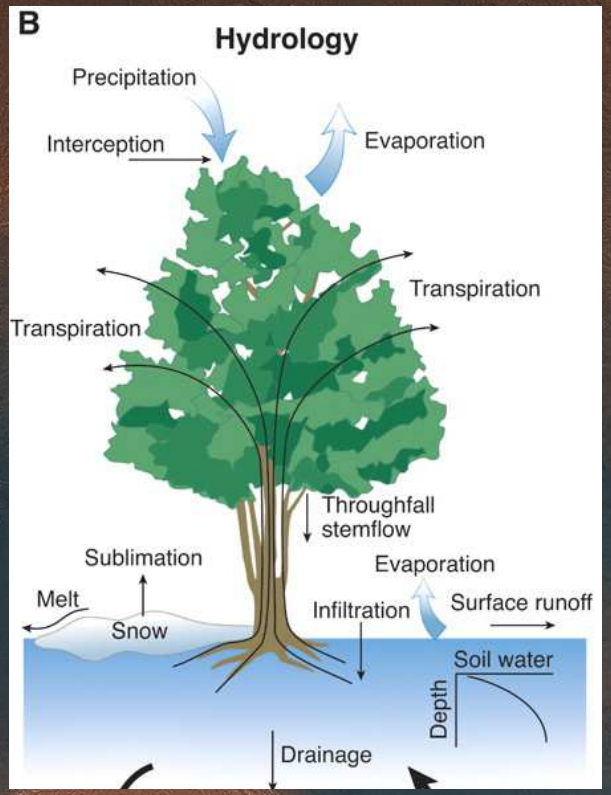
driven with **earth observation** data

Dorigo et al (2017), GLEAM (2016)

**pre-existing** model framework

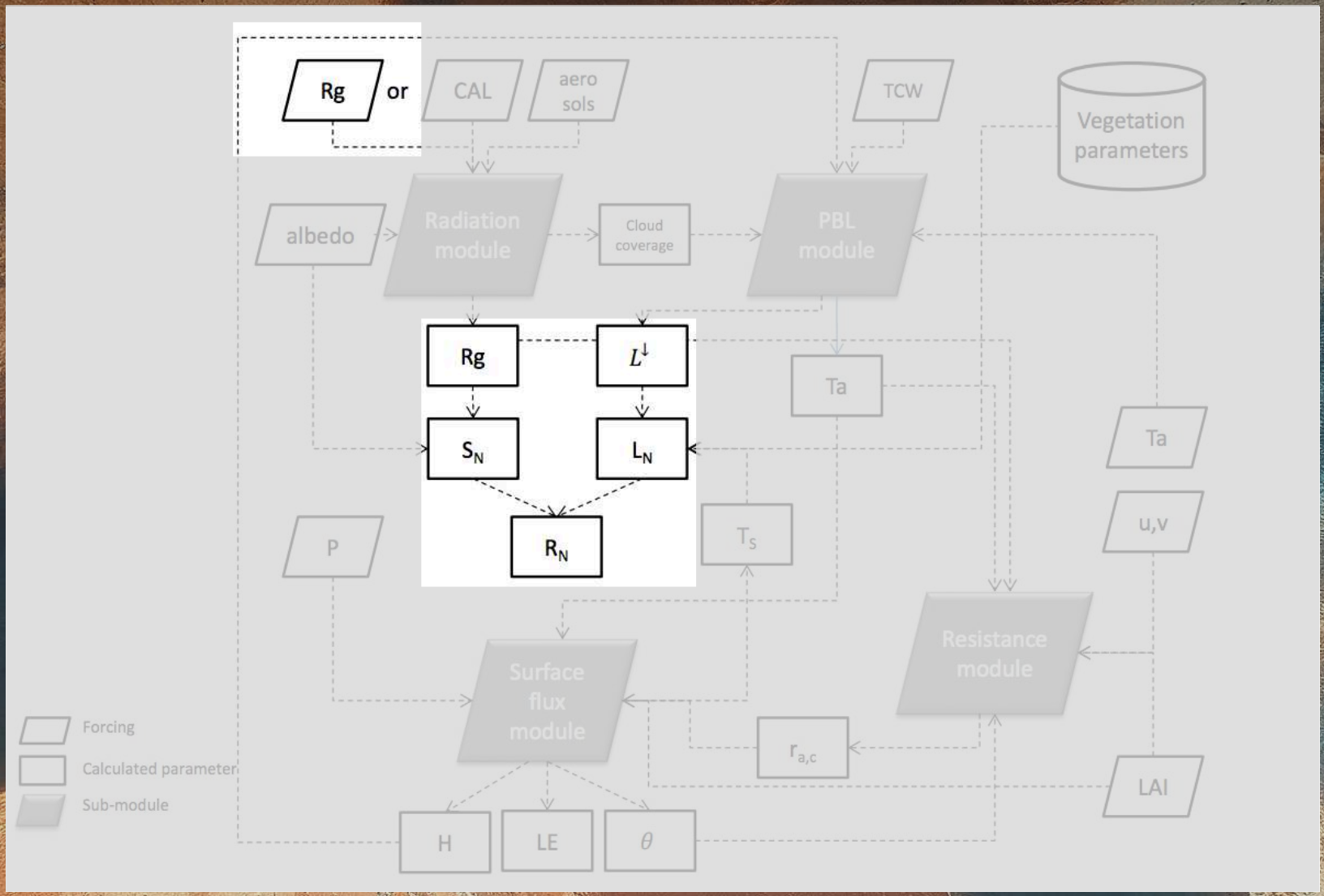
# Method



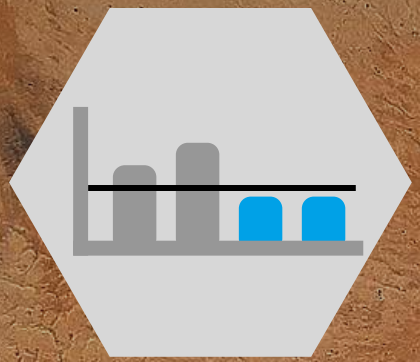

Bonan (2008)

# Method




Loew et al (2015)

# Research Gap



lots of **different drought indices**

Van Loon (2014), Sheffield and Wood (2011)

focus on **extreme** events

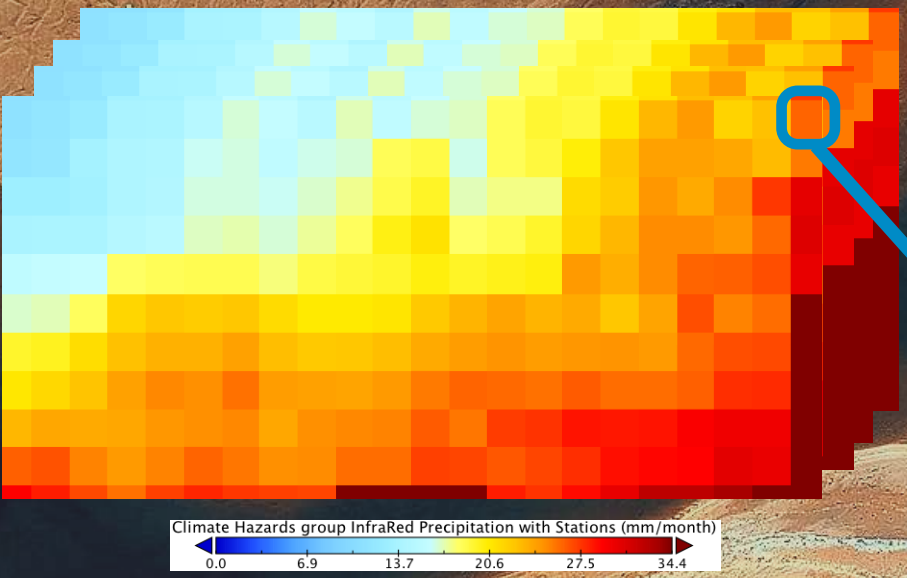
Anderson et al (2012)

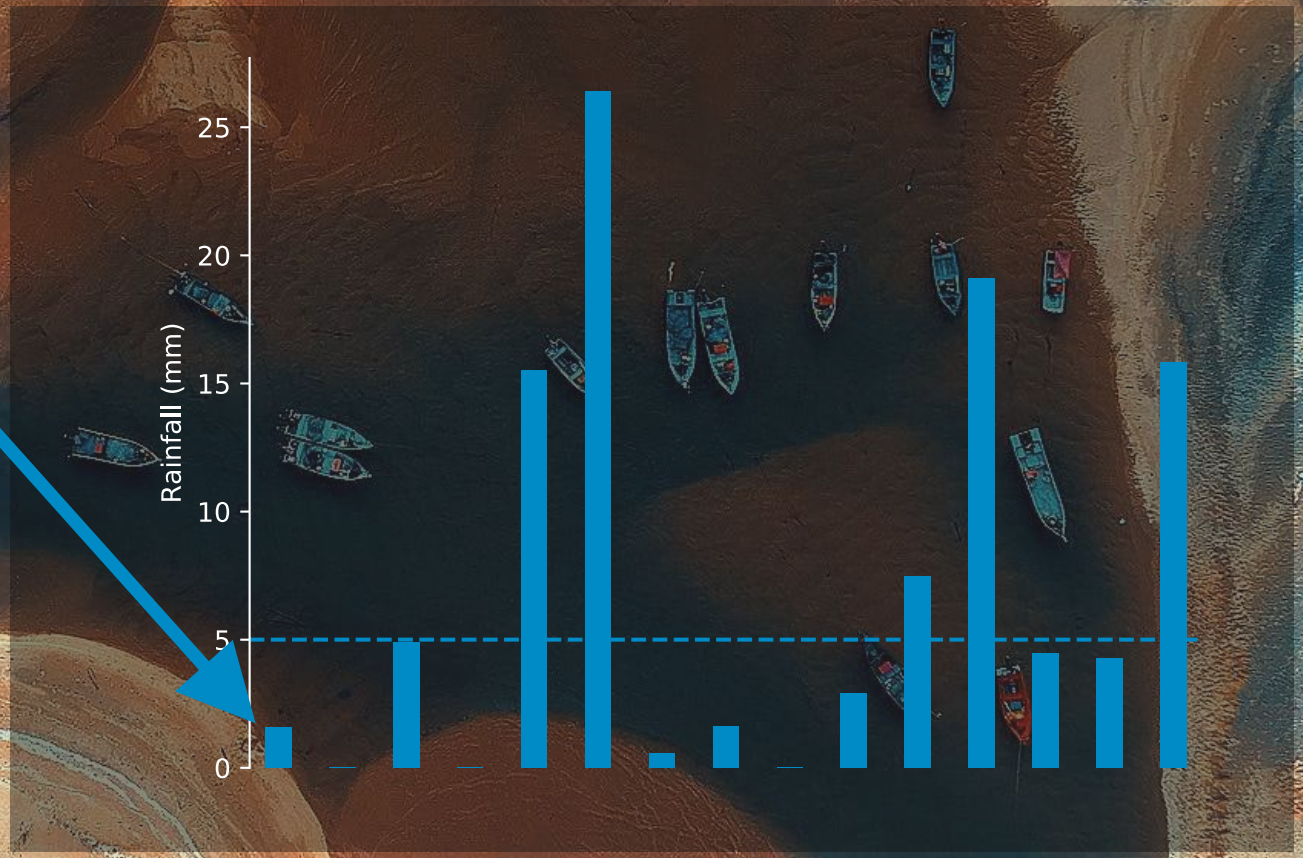
move to **incorporating multiple** variables

Vincente Serrano et al (2016)

# Method

## persistence & risk

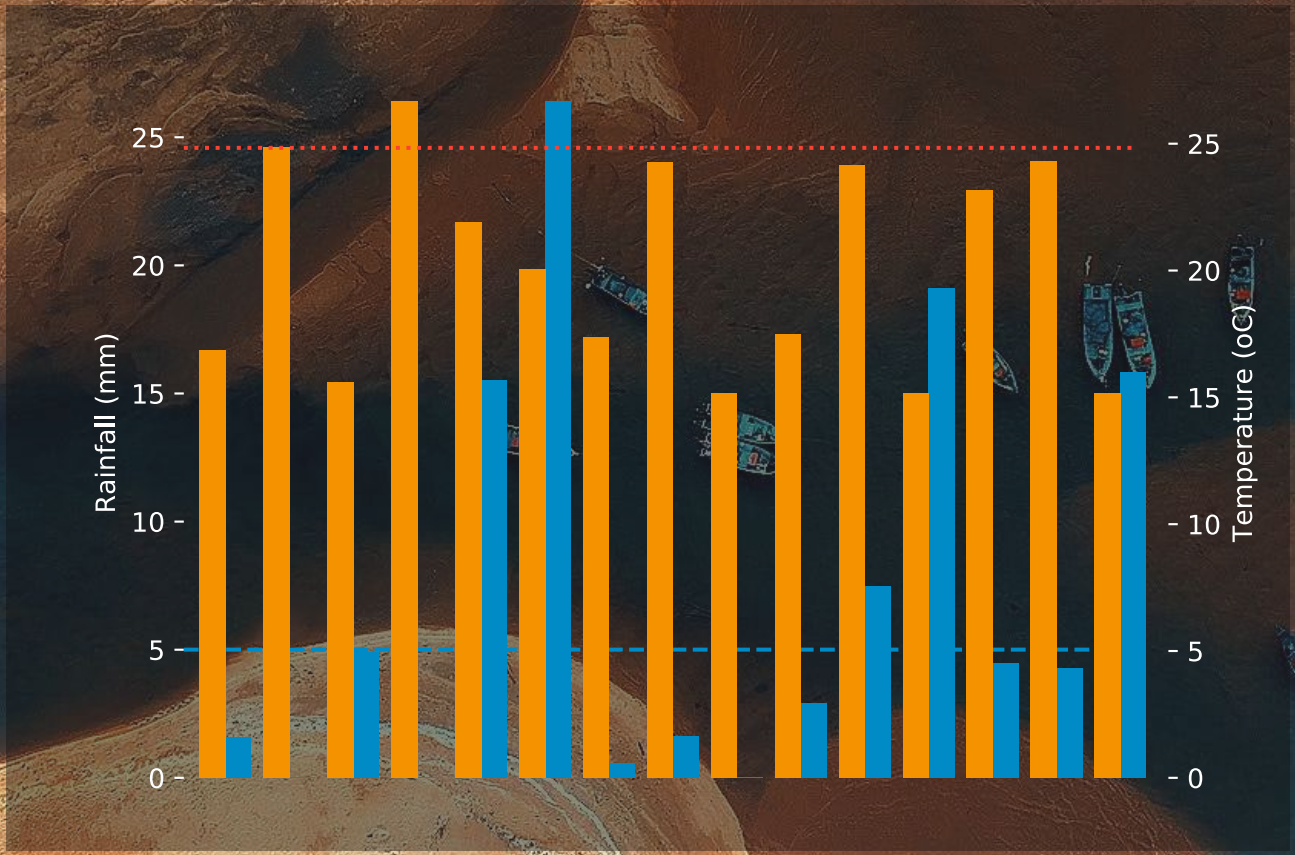



Dyer (personal communication)

# Method

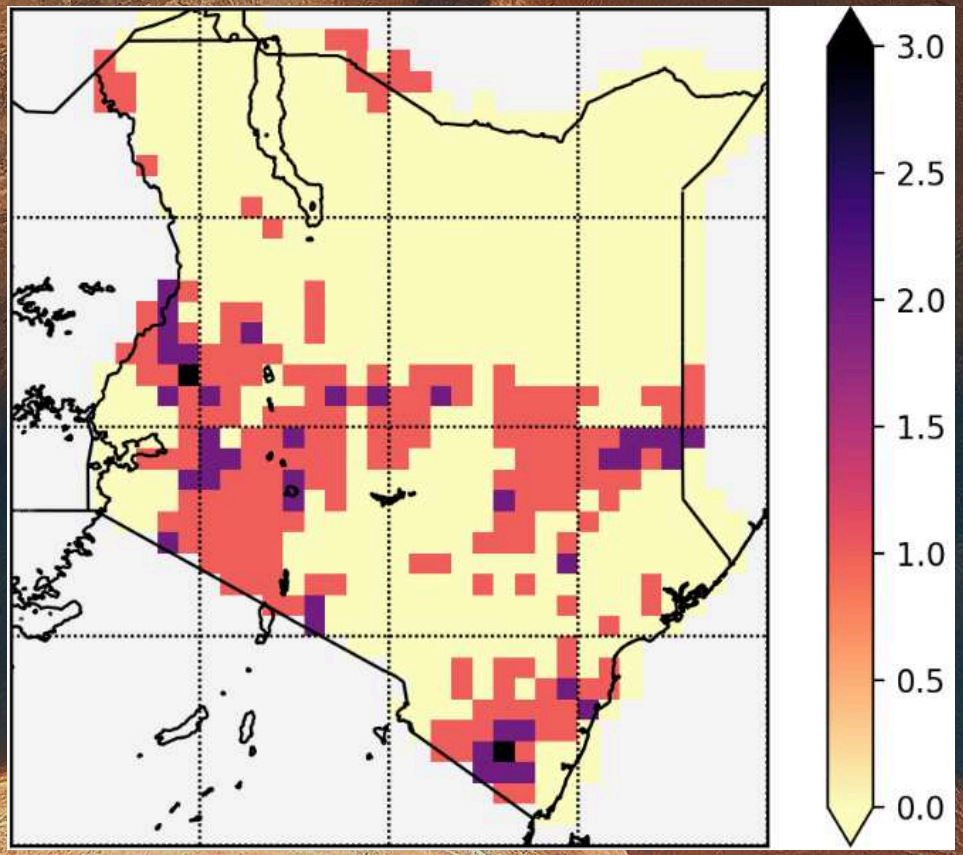
## persistence & risk



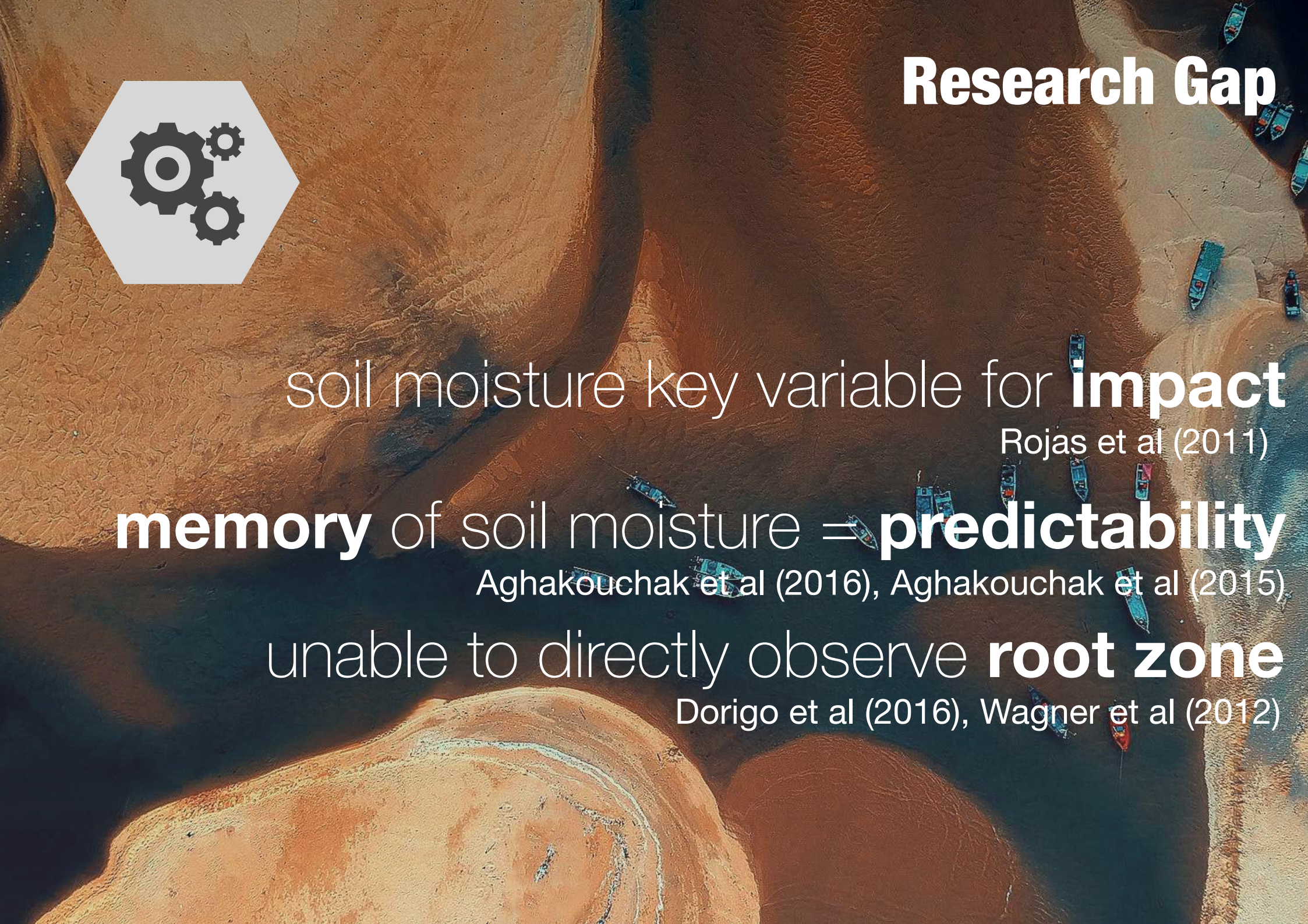

Dyer (personal communication)

# Method

How often is a **dry MAM** followed by a **dry OND**?




Ellen Dyer (2018 REACH)



# Research Gap

soil moisture key variable for **impact**

Rojas et al (2011)

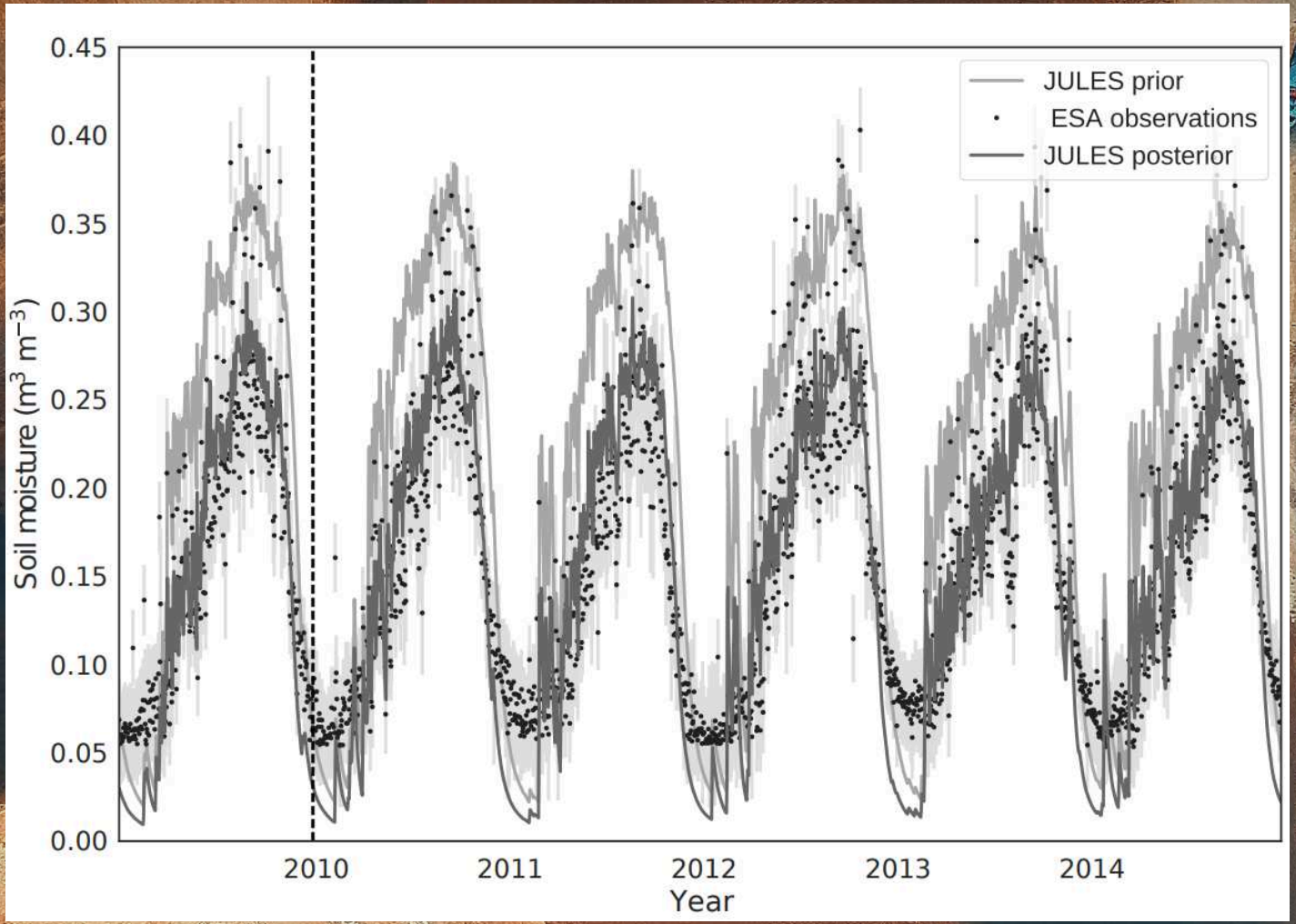
**memory** of soil moisture = **predictability**

Aghakouchak et al (2016), Aghakouchak et al (2015)

unable to directly observe **root zone**

Dorigo et al (2016), Wagner et al (2012)

# Method




Pinnington et al (2018)

# Research Gap

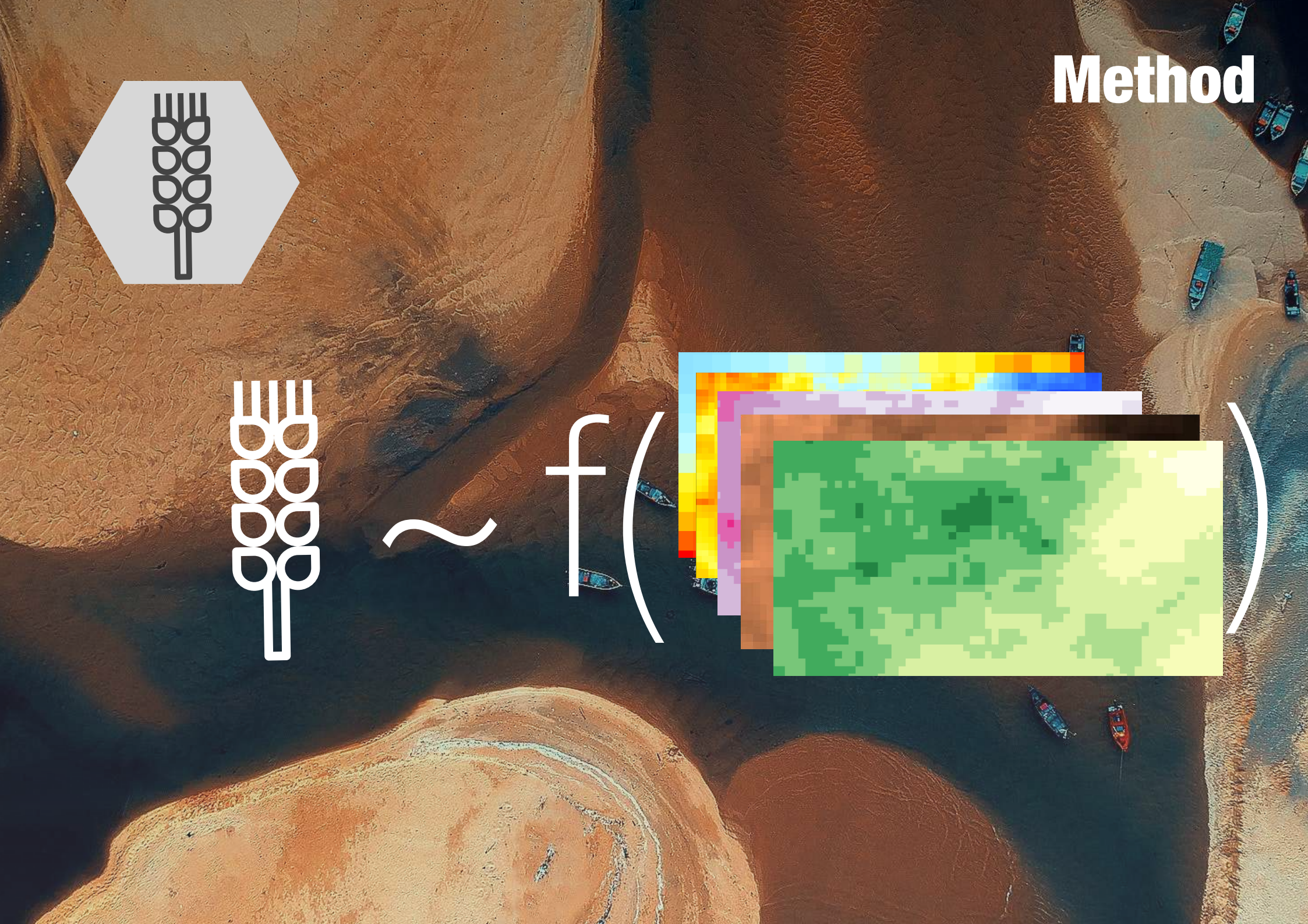
impact often considered at **national scale**

Enenkel et al (2011)

Increased predictive **accuracy using GPs**

J, You et al (2017)

# Method



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