

# **How did humans exacerbate climate change through changes in the water cycles?**

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**NGO People and Water, Slovakia**

**ANK, October, 5th 2011**

# Topics of this presentation:

- Current paradigm of water management in European policy face-to-face climate change
- Overlooked aspects of water and energy flows
- New paradigm of water management

**CURRENT PARADIGM OF  
WATER MANAGEMENT IN  
EUROPEAN POLICY FACE-TO-  
FACE CLIMATE CHANGE**

# Climate Change

- 12 of the past 13 years (1995-2007) are among the 13 warmest years on record
- Serious dry spells (droughts) have affected vast regions of Europe, Asia, Canada, Africa and Australia.
- The number of heavy floods (100-200 year floods) increased significantly during the second half of the 20th century.

# Climate Change

„...the 21st century will produce... more unpredictable hydrological cycle... new rainfall patterns and more extreme weather events, including floods and droughts.“

*/Human Development Report 2006, UNDP/*

# European Water Policy

- Water Framework Directive (2000/60/EC)
- The challenge of water scarcity and droughts in the EU, 2007
- Green Book: Adaptation to Climate Change in Europe, 2007
- EC Flood Directive 2007/60/ES
- other ones...

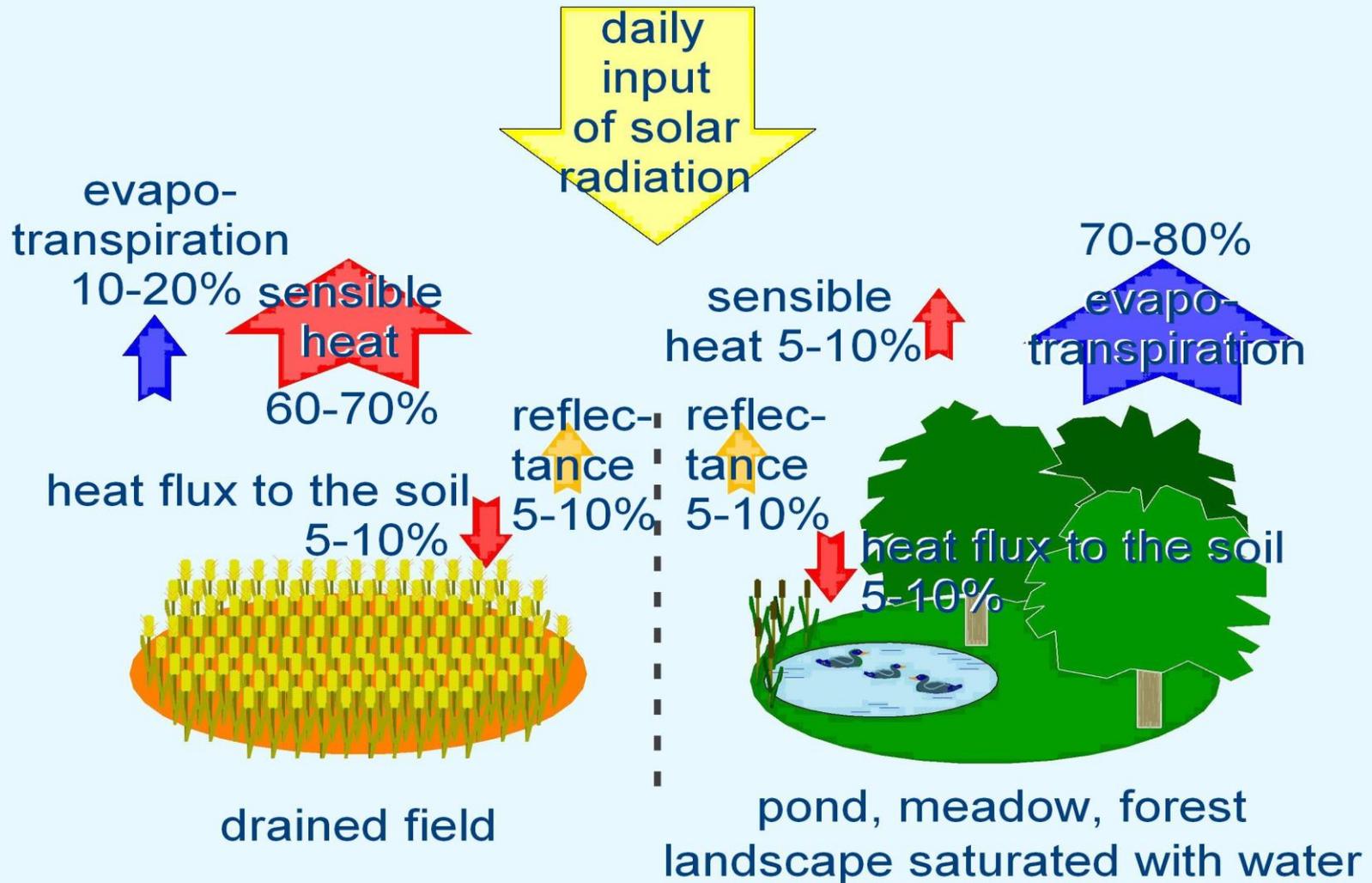
# European Water Policy

## Some handicaps:

- insufficient change of policy face-to-face radically changed situation
- clash of sanitation, anti-drought and anti-flood policy
- lack of prevention
- passive attitude towards climate change

# **OVERLOOKED ASPECTS OF WATER AND ENERGY FLOWS**

# The distribution of solar energy on land with and without water

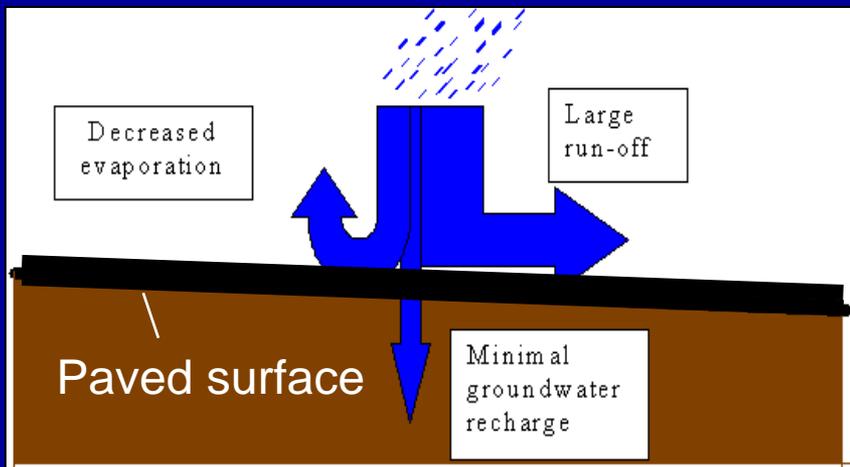
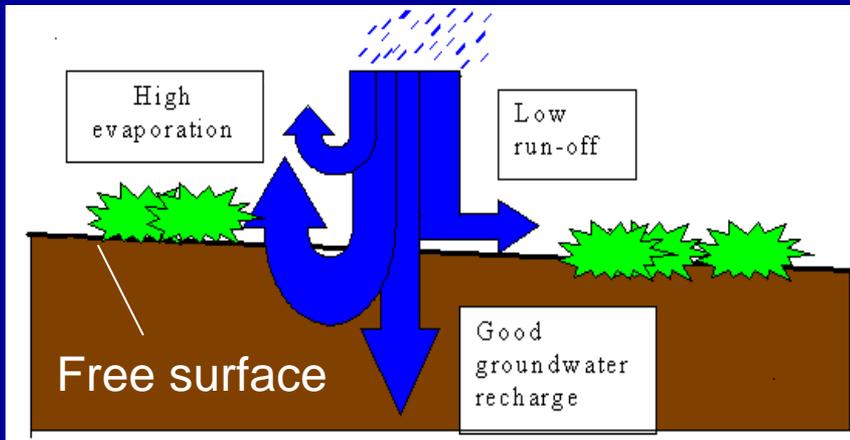


# SOIL SEALING IN CITIES



- about 40 billion m<sup>3</sup> of rainwater sluiced from municipalities of Europe annually

# PAVEMENT IMPACT



- infiltration decreases (groundwater recharge decreases)
- evaporation decreases (air humidity decreases)
- runoff increases (through sewage to rivers and sea)

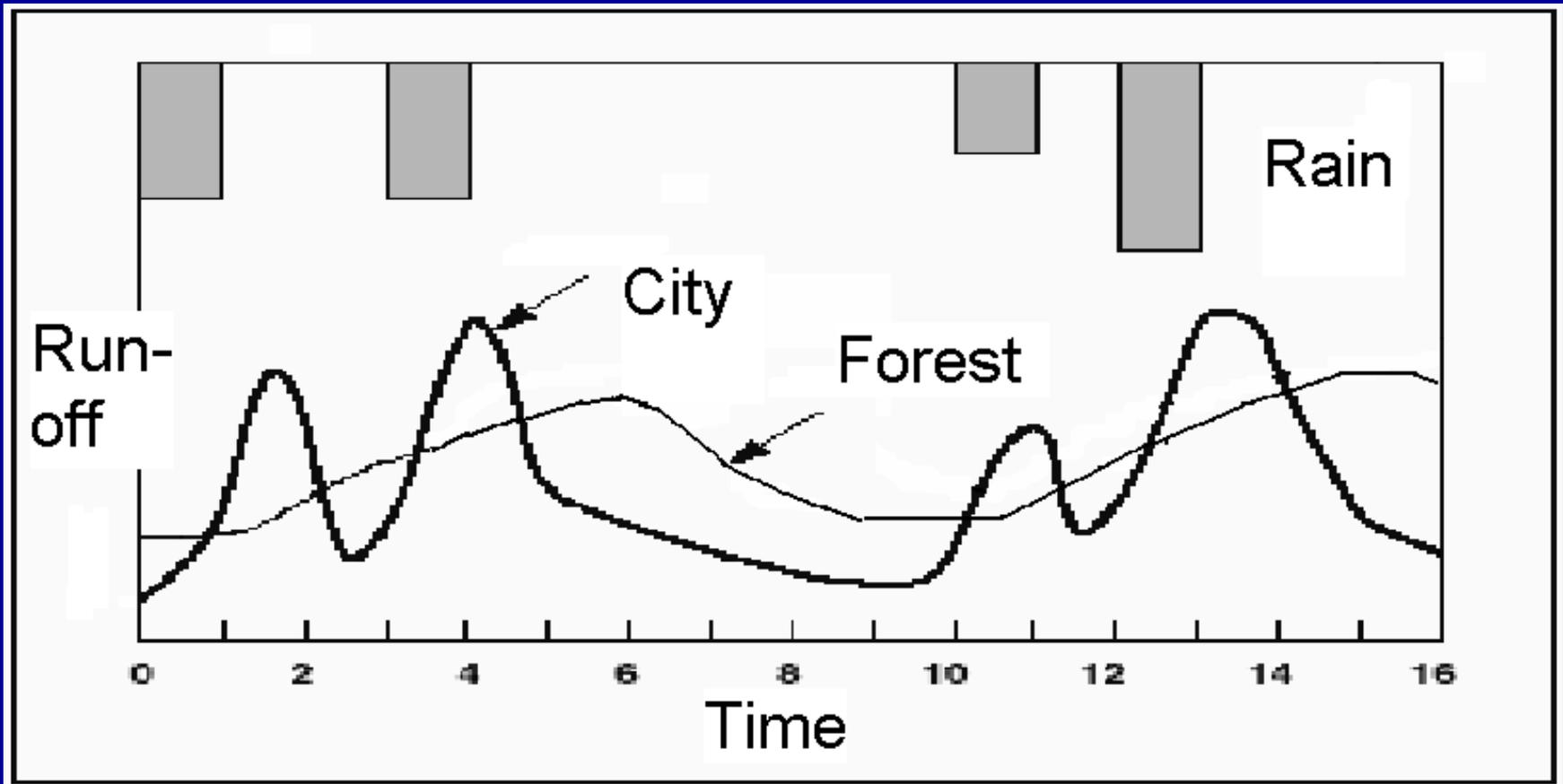


People's Water University



Typical Infrastructure for rainwater management

# RUNOFF FROM URBAN AND FOREST ENVIRONMENTS

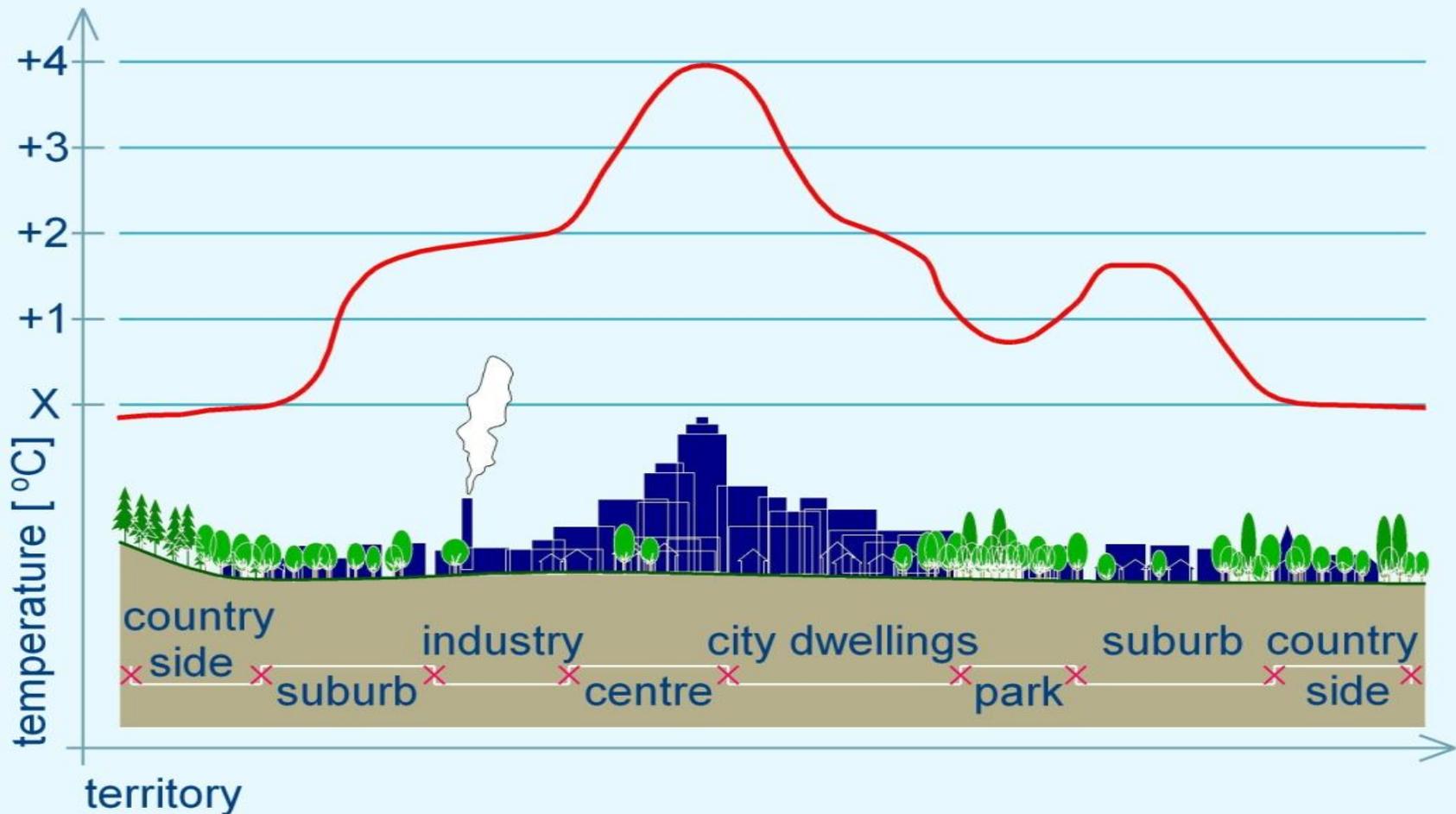


Decrease of runoff is overlooked  
flood prevention measure

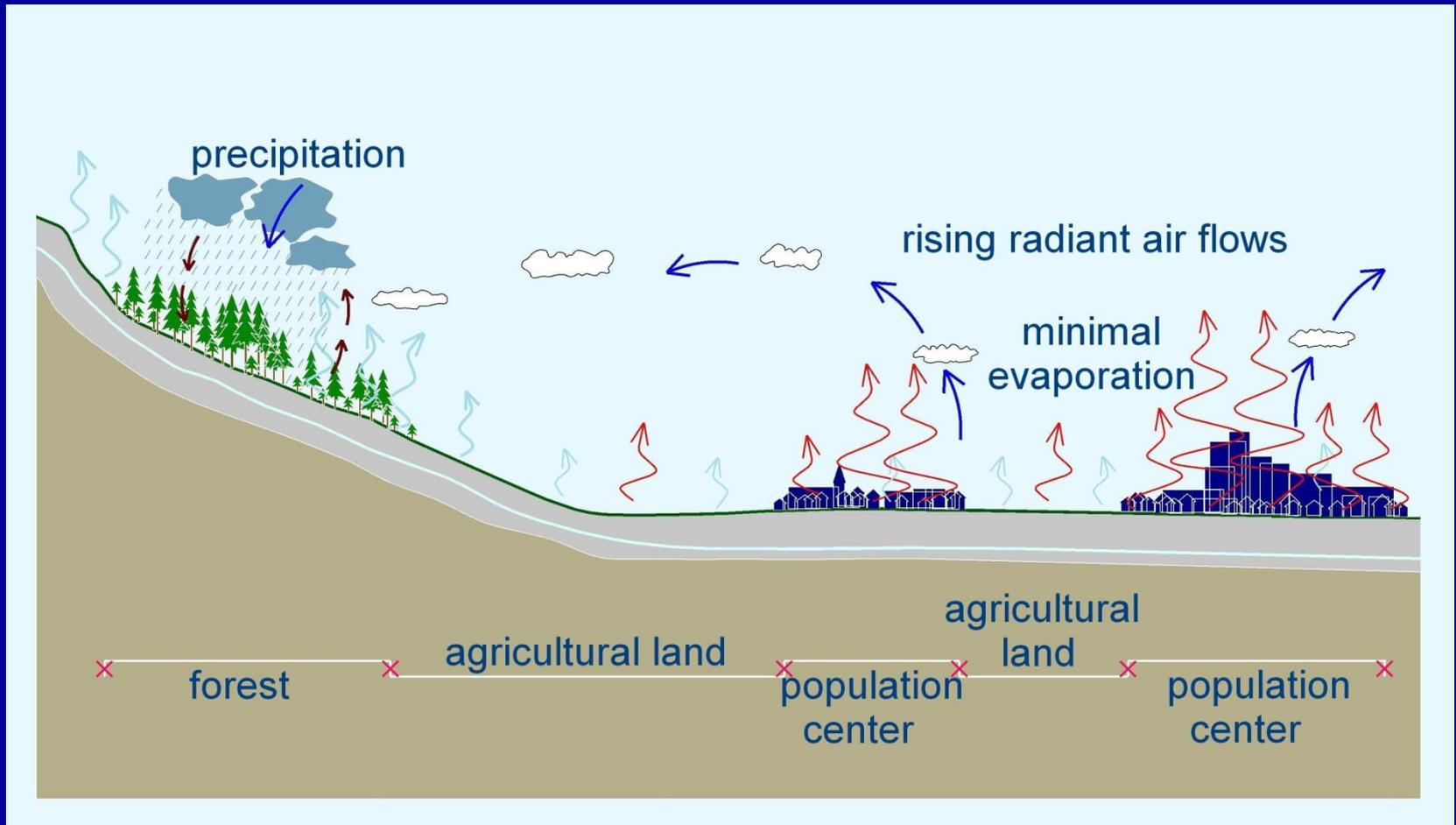
# PHOTO OF A CITY TAKEN WITH A THERMAL CAMERA



# Temperatures on the land with and without water

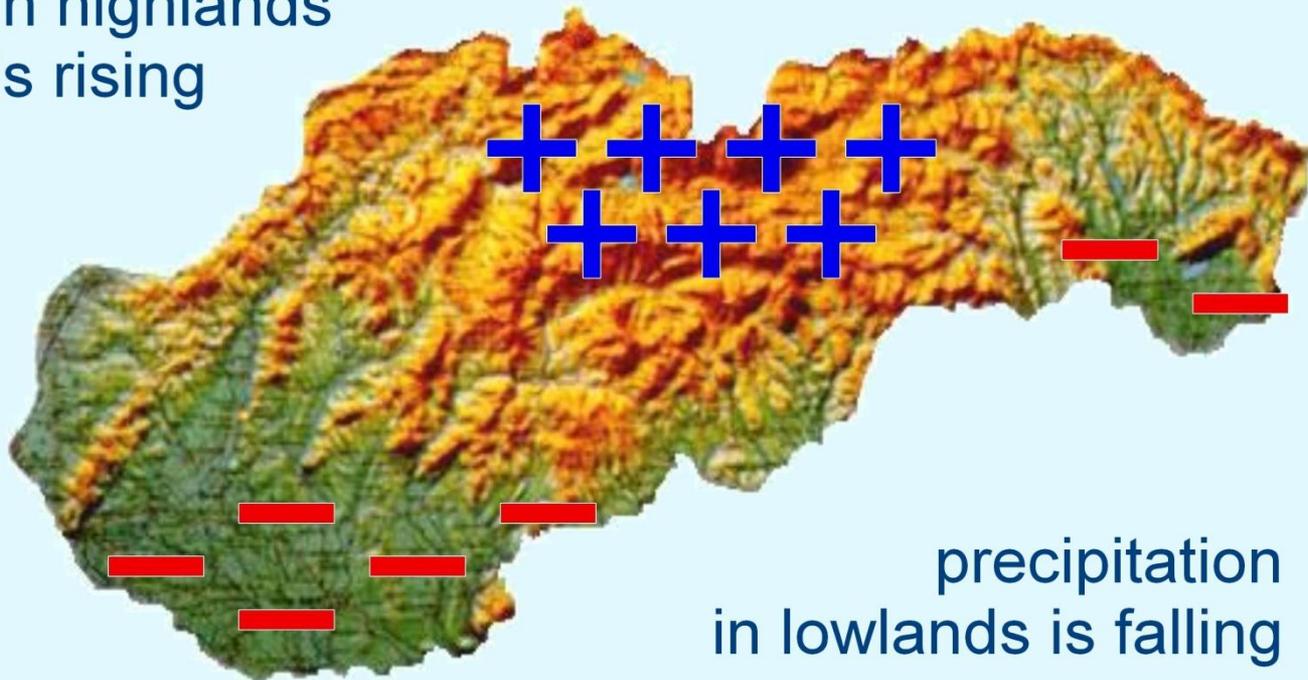


# The impact of the transformation of land on small water cycles



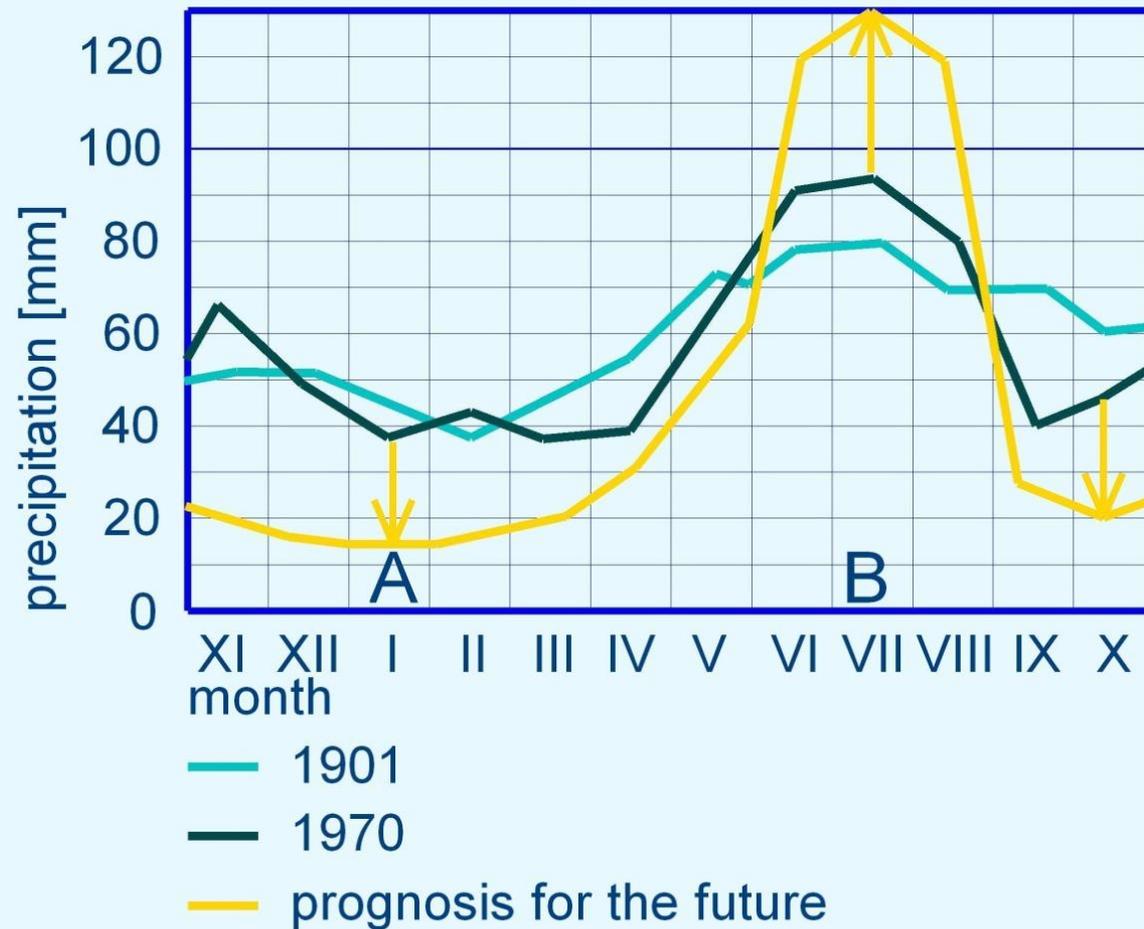
# The rain in Slovakia fails mainly on the plain...

precipitation  
in highlands  
is rising

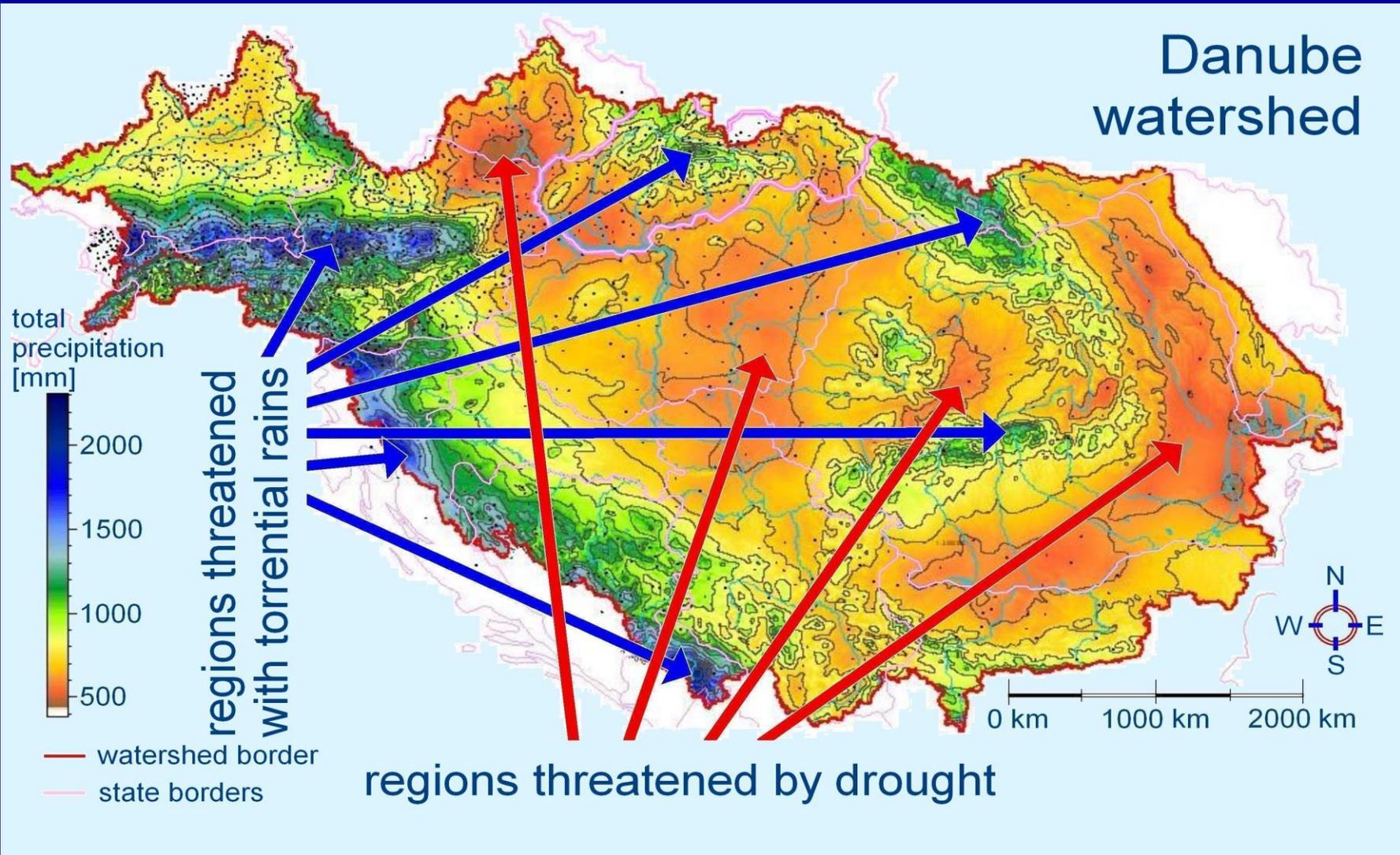


precipitation  
in lowlands  
is falling

# PRECIPITATION TRENDS IN SLOVAKIA



# Precipitation in Danube watershed



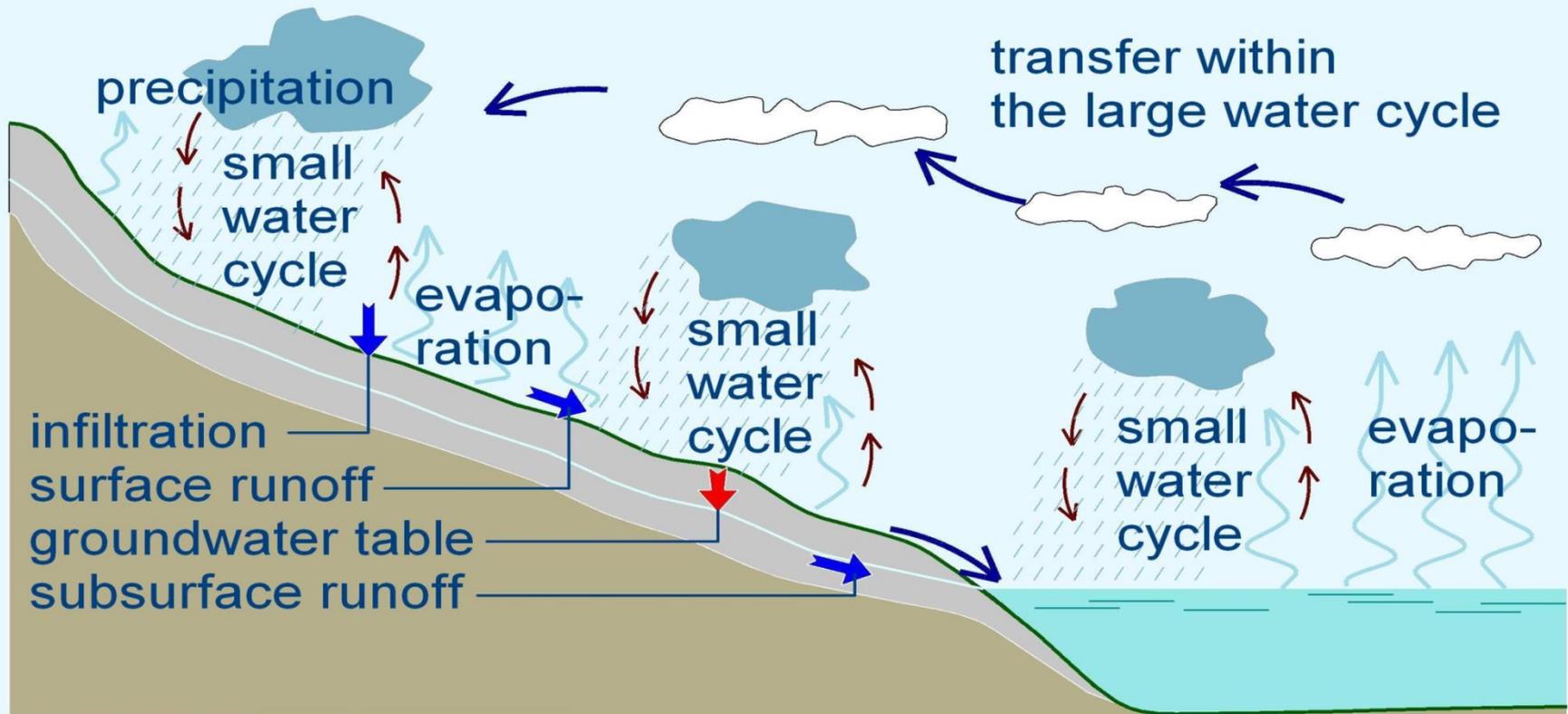
# Polluted runoff harms water quality

- Flows into waterways untreated
- Harms fish and wildlife
- Kills vegetation
- Fouls drinking water supplies
- Makes recreation areas unsafe



# **NEW PARADIGM OF WATER MANAGEMENT**

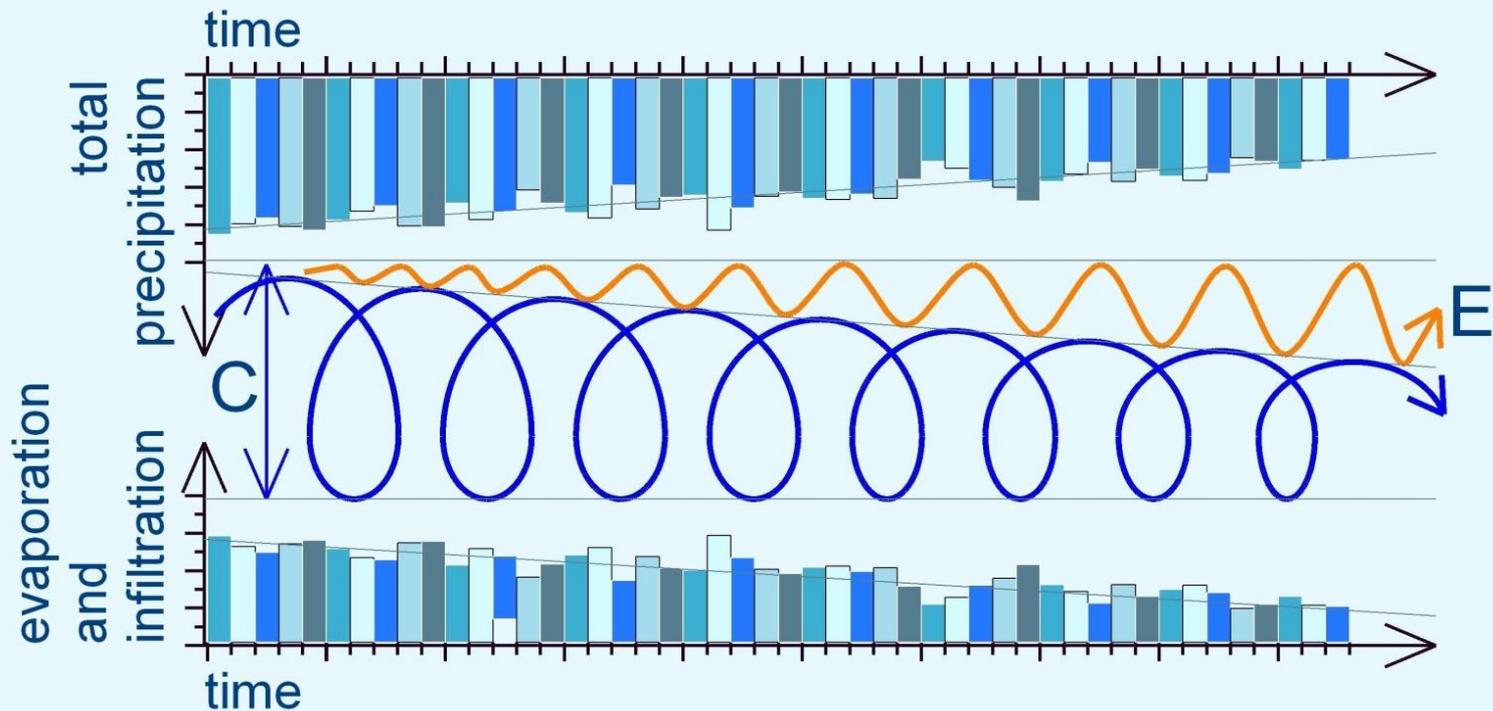
# The large and small water cycles



→ large water cycle  
↓ ↑ small water cycle

land  
ocean

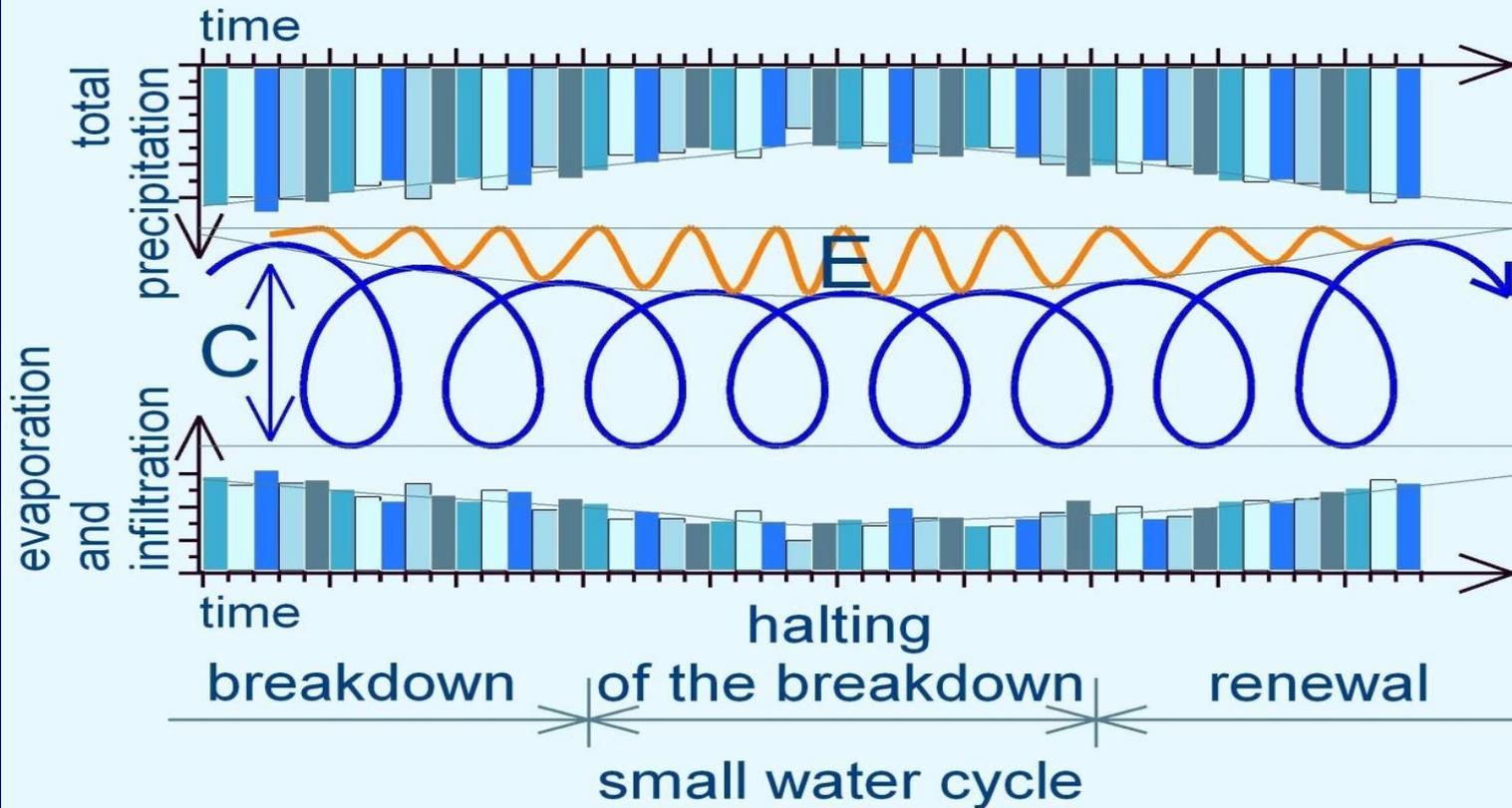
# The growth of extreme weather with the decline of water cycle



C - diagram of the circulation of water on land

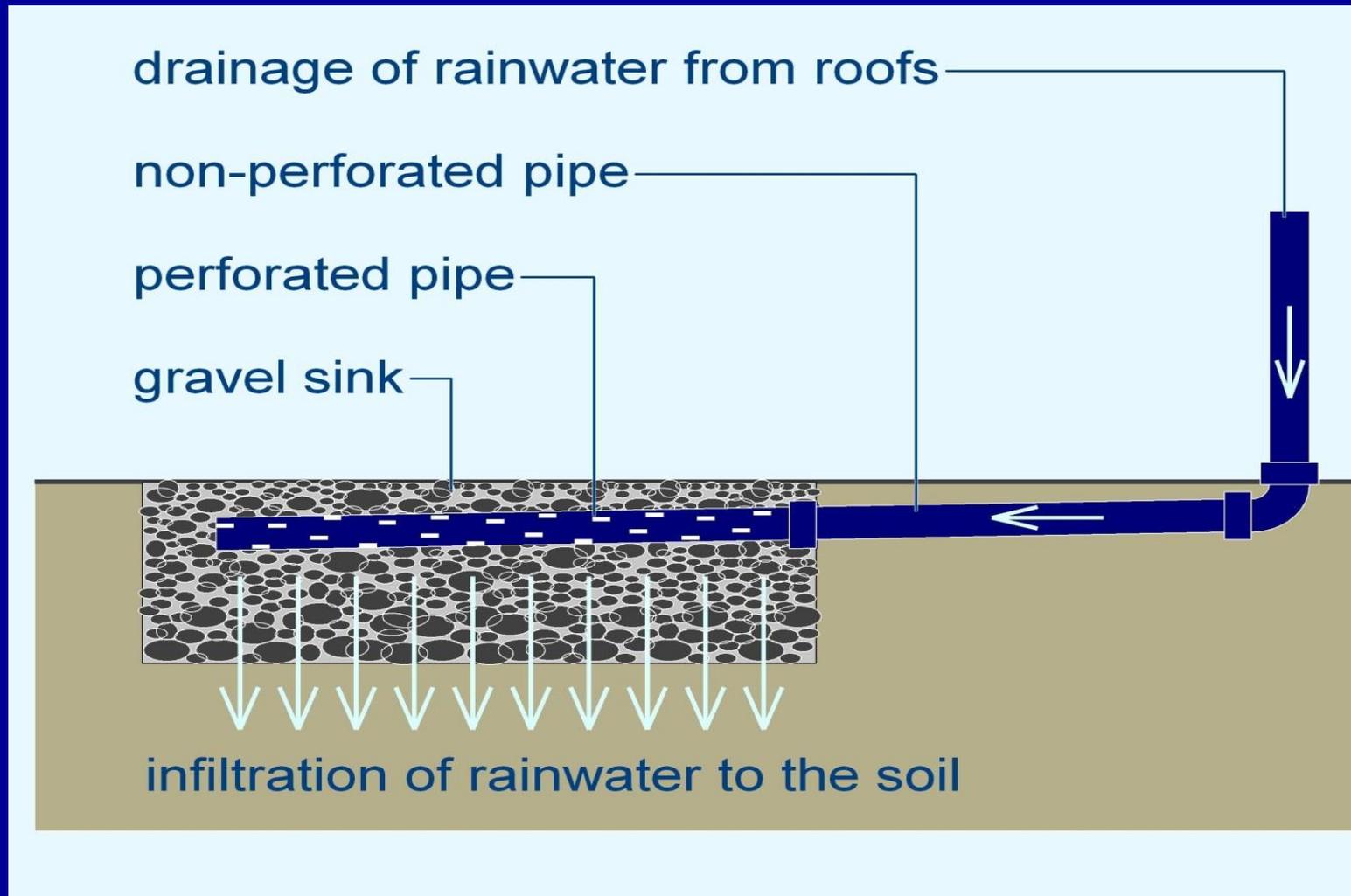
E - diagram of extreme weather events

# The destruction and renewal of the small water cycle



- C - diagram of the circulation of water on land
- E - diagram of extreme weather events

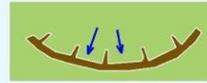
# Rainwater harvesting from roofs in cities



# Rainwater harvesting on slopes

## Microstructures for the rainwater harvesting on land

Contoured barrages



Terraces



Eyebrow terraces



Pits



Vallerani-type microcatchments



Semicircular bunds



Triangular bunds



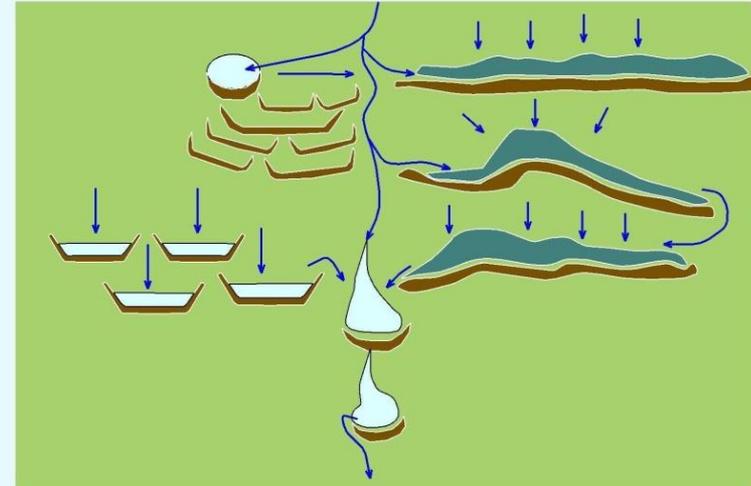
Meskat



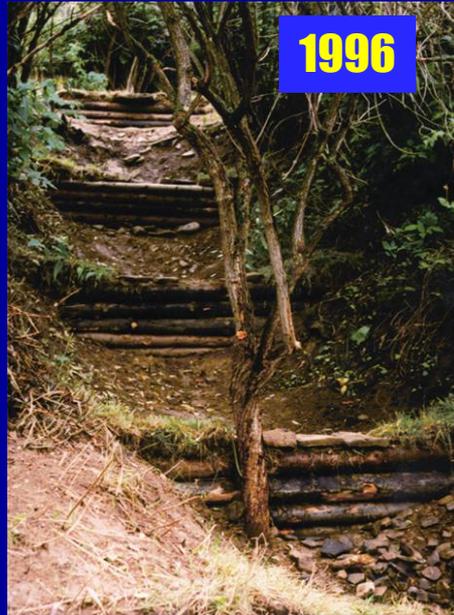
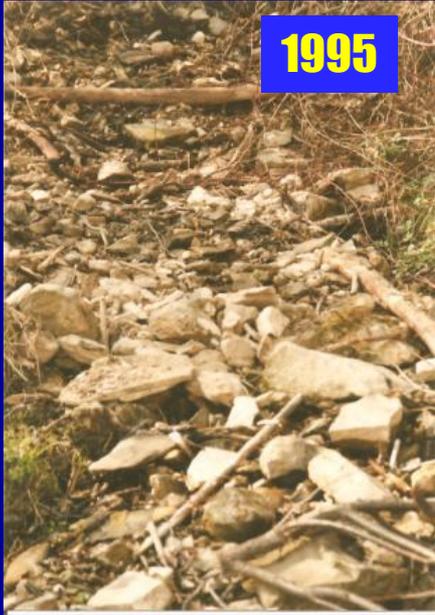
Negarim



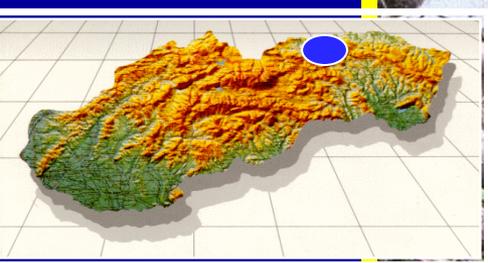
## Combination of different rainwater harvesting technologies



# BLUE ALTERNATIVE - to Tichý Potok water dam



# Flood protection in WATER FOREST after wind storm in High Tatras,





**November, 28<sup>th</sup> 2005**



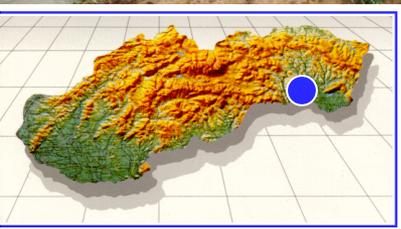
**June, 6<sup>th</sup> 2006**



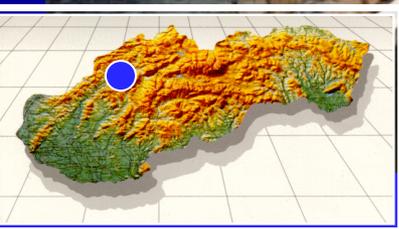
**June, 30<sup>th</sup> 2006**



**September, 16<sup>th</sup> 2006**

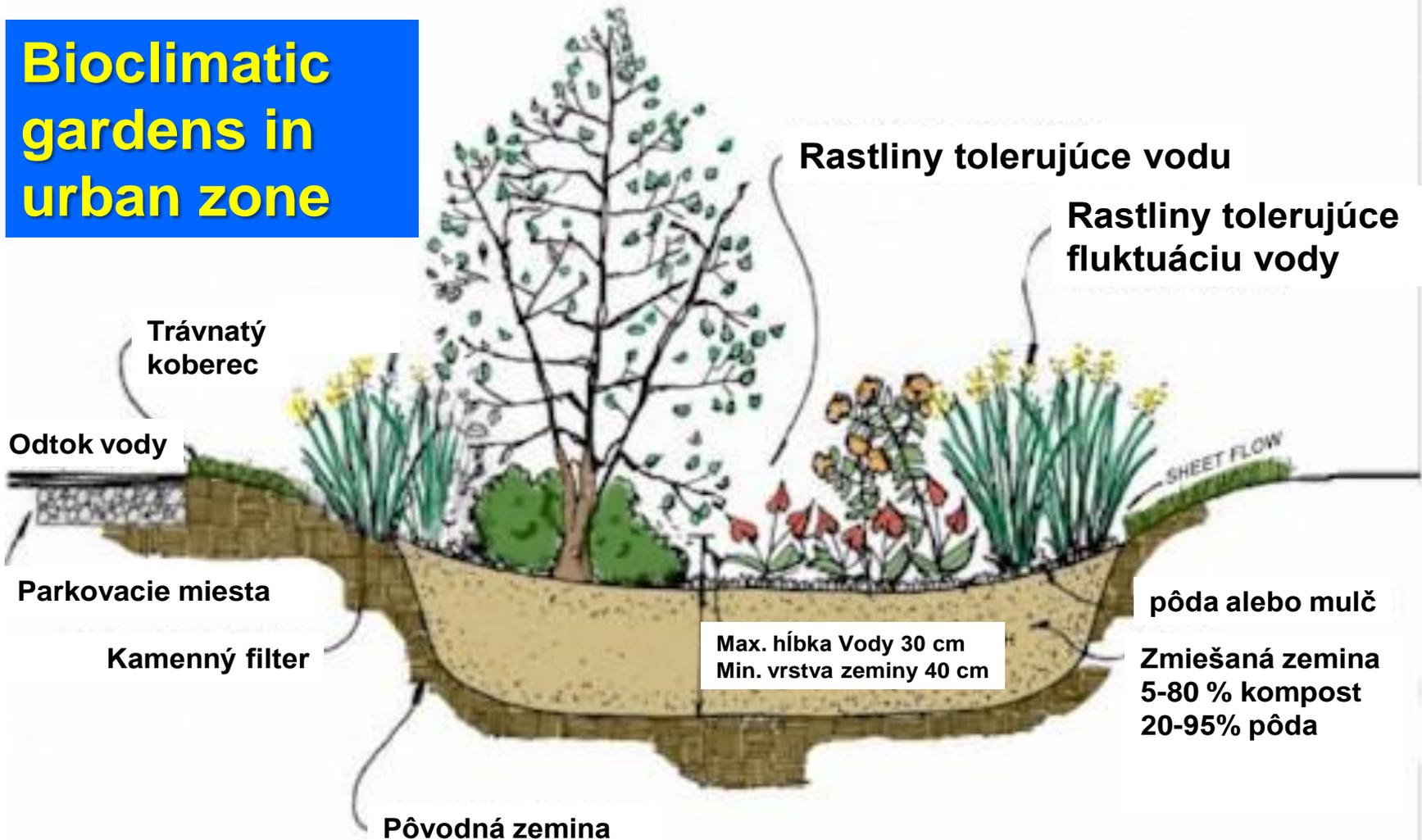


# Restoration of water sources in urban zone Košice,



**Hričov Water Ways, October 2008**

# Bioclimatic gardens in urban zone



# Location of the rain garden

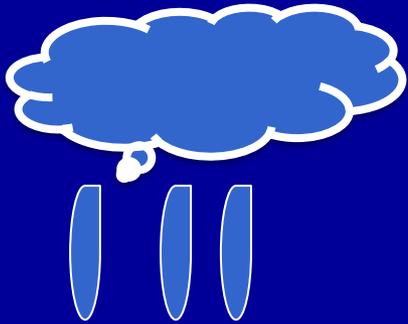


© Fitch & Co.

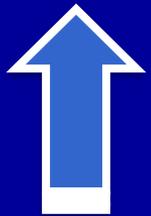
[www.montgomerycountymd.gov/mc/services/dep/greenman/rain.htm](http://www.montgomerycountymd.gov/mc/services/dep/greenman/rain.htm)

# NEW WATER DEAL

More clouds



More soft rain

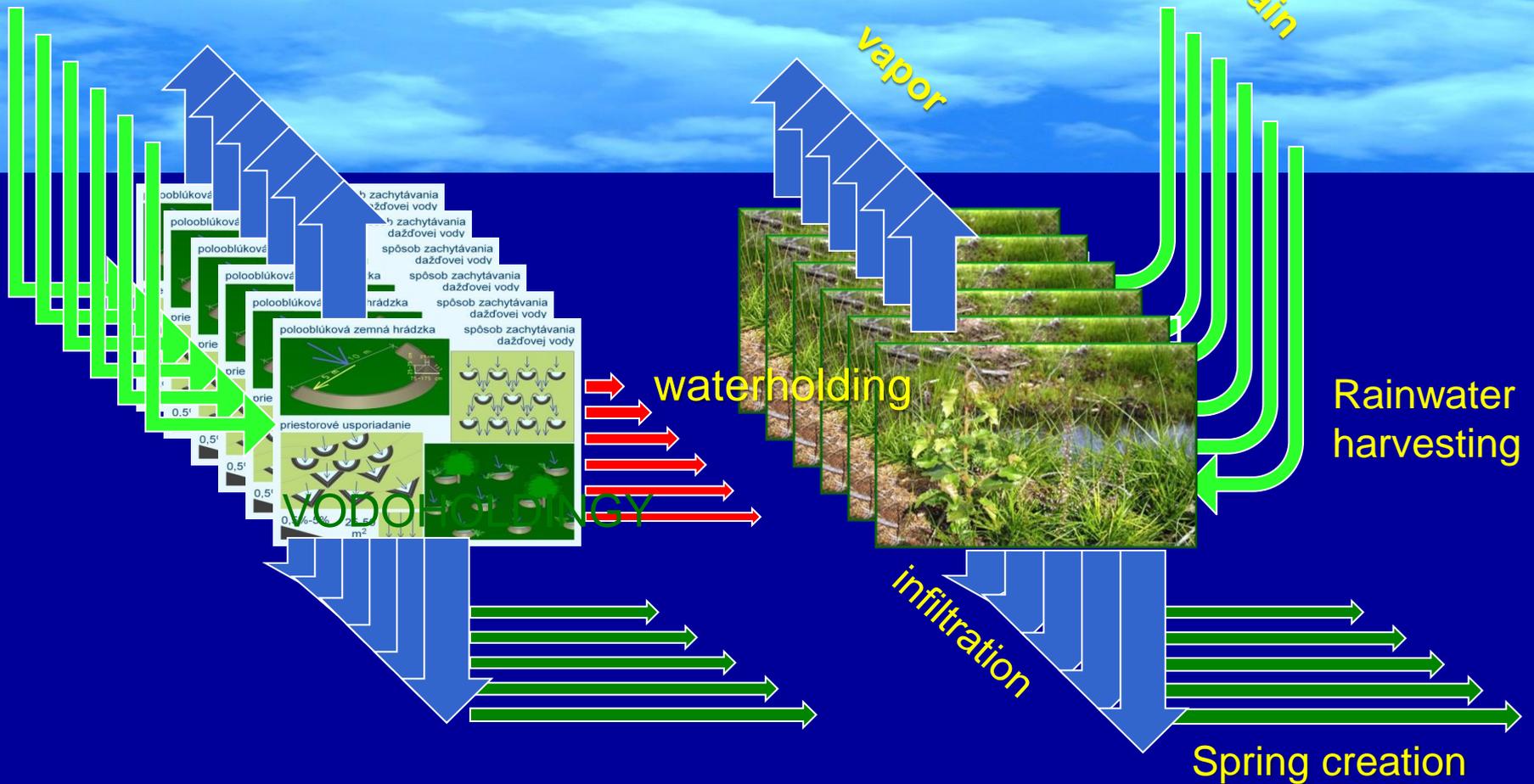


More vapor from land

More vegetations and biodiversity

More water in soil

# Clouds creation



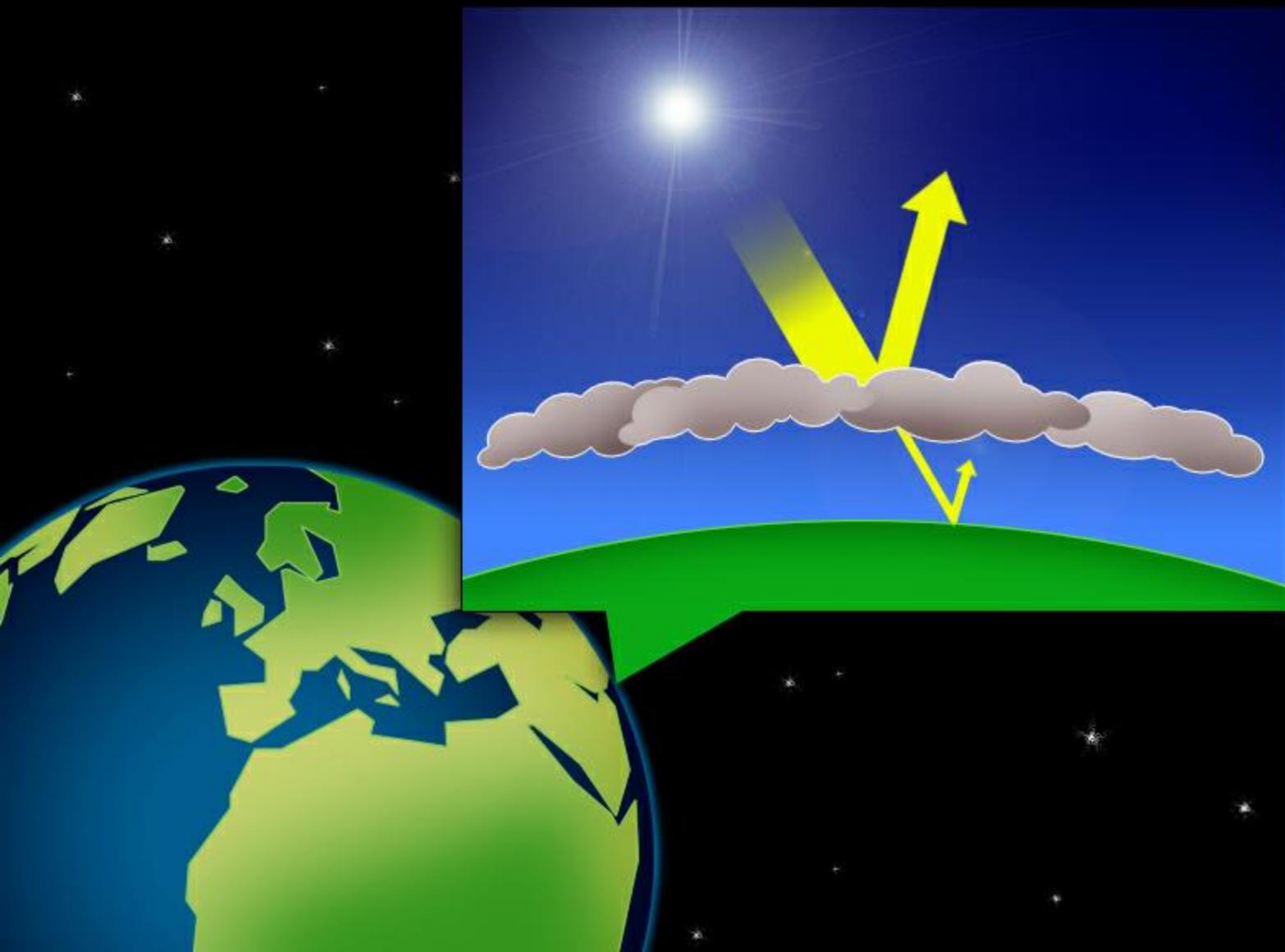
Principle of water cycle restoration

# Water for the Recovery of the Climate

A New Water Paradigm

M. Kravčík, J. Pokorný, J. Kohutiar,  
M. Kováč, E. Tóth

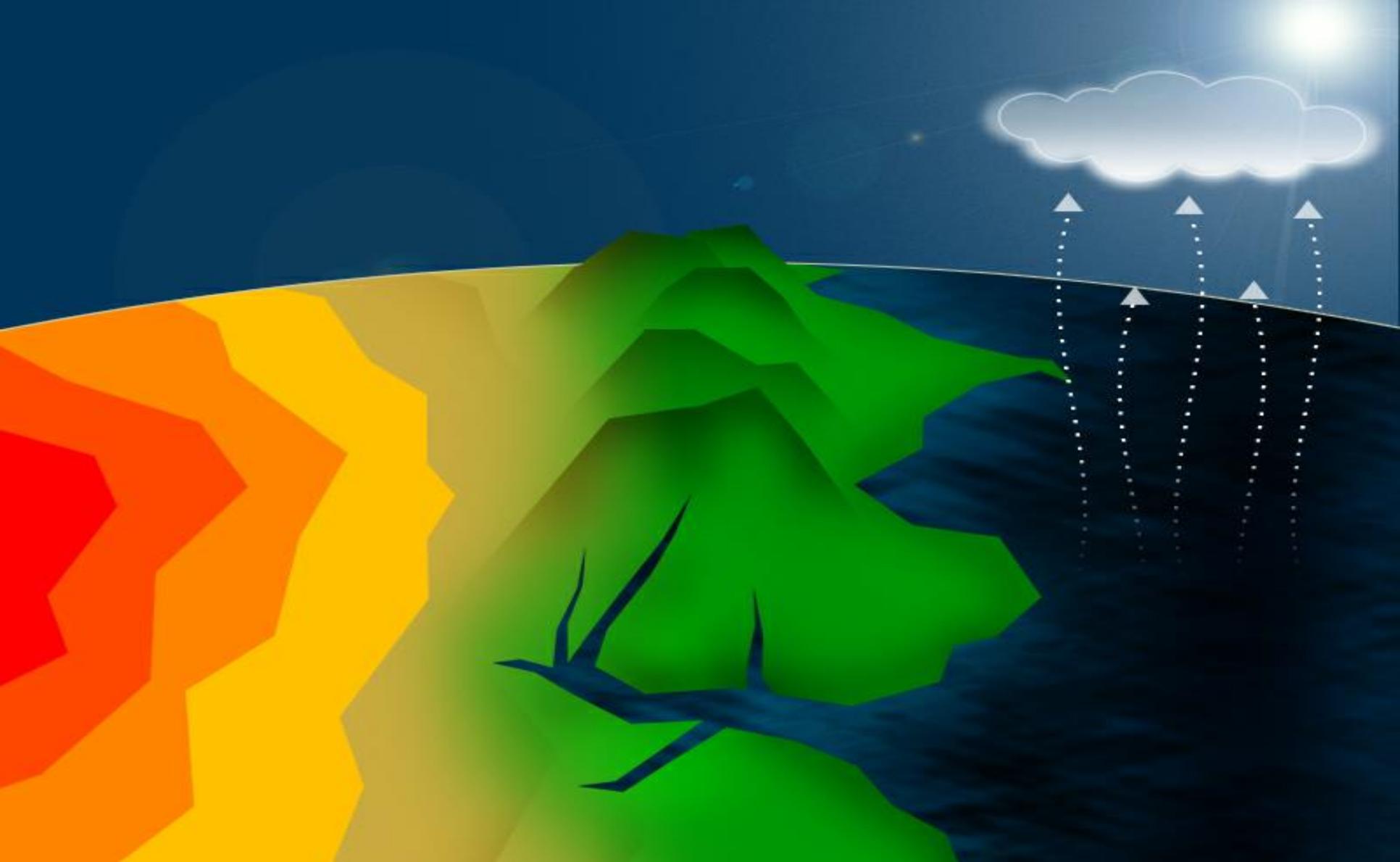
- **humanity accelerates the runoff from land**
- **more solar energy is transformed into sensible heat**
- **draining of a land can be reversed through comprehensive conservation of rainwater**
- **renewal of small water cycle over land can temper extreme weather events and ensure a growth in water reserves**
- **[www.waterparadigm.org](http://www.waterparadigm.org)**



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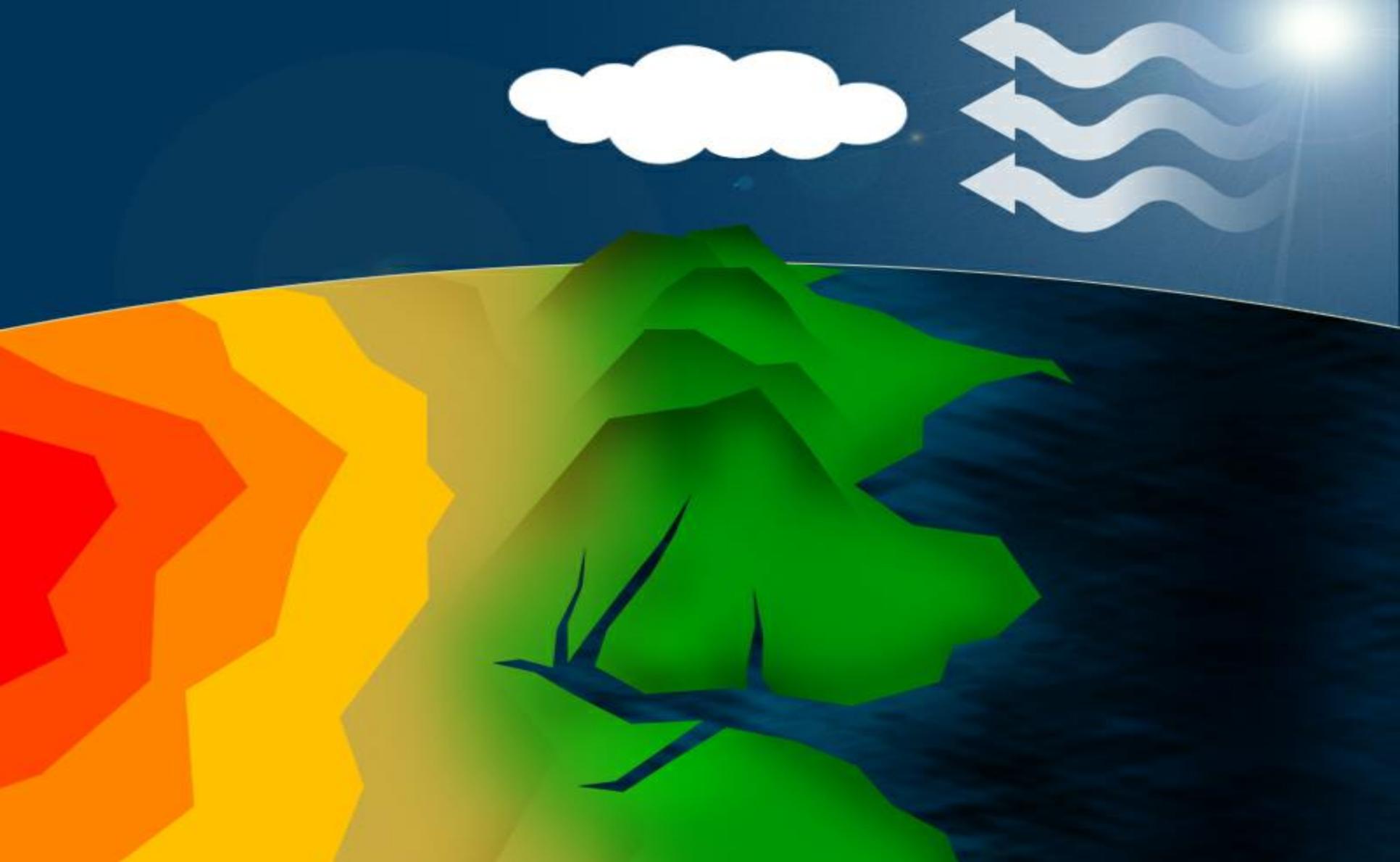
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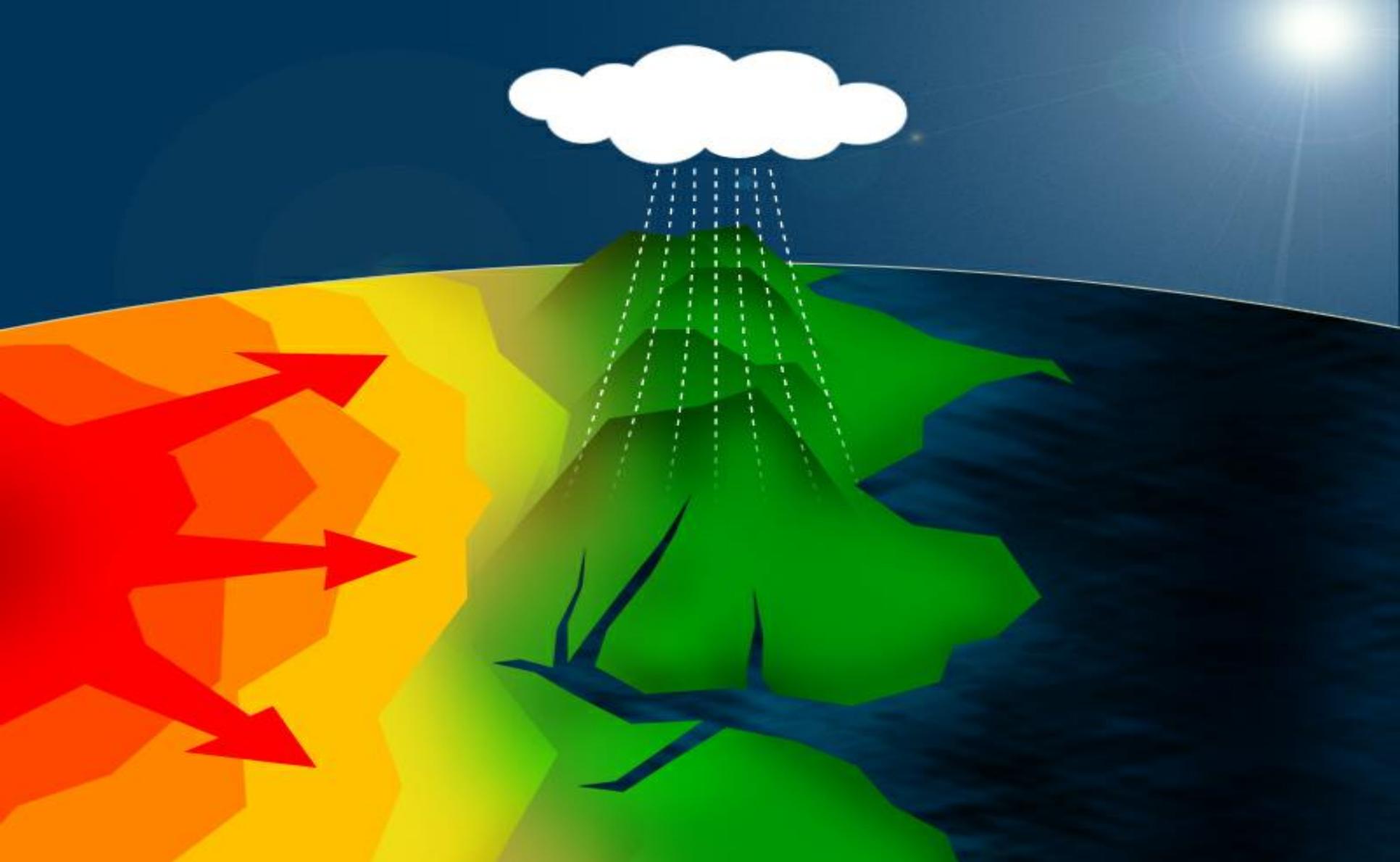
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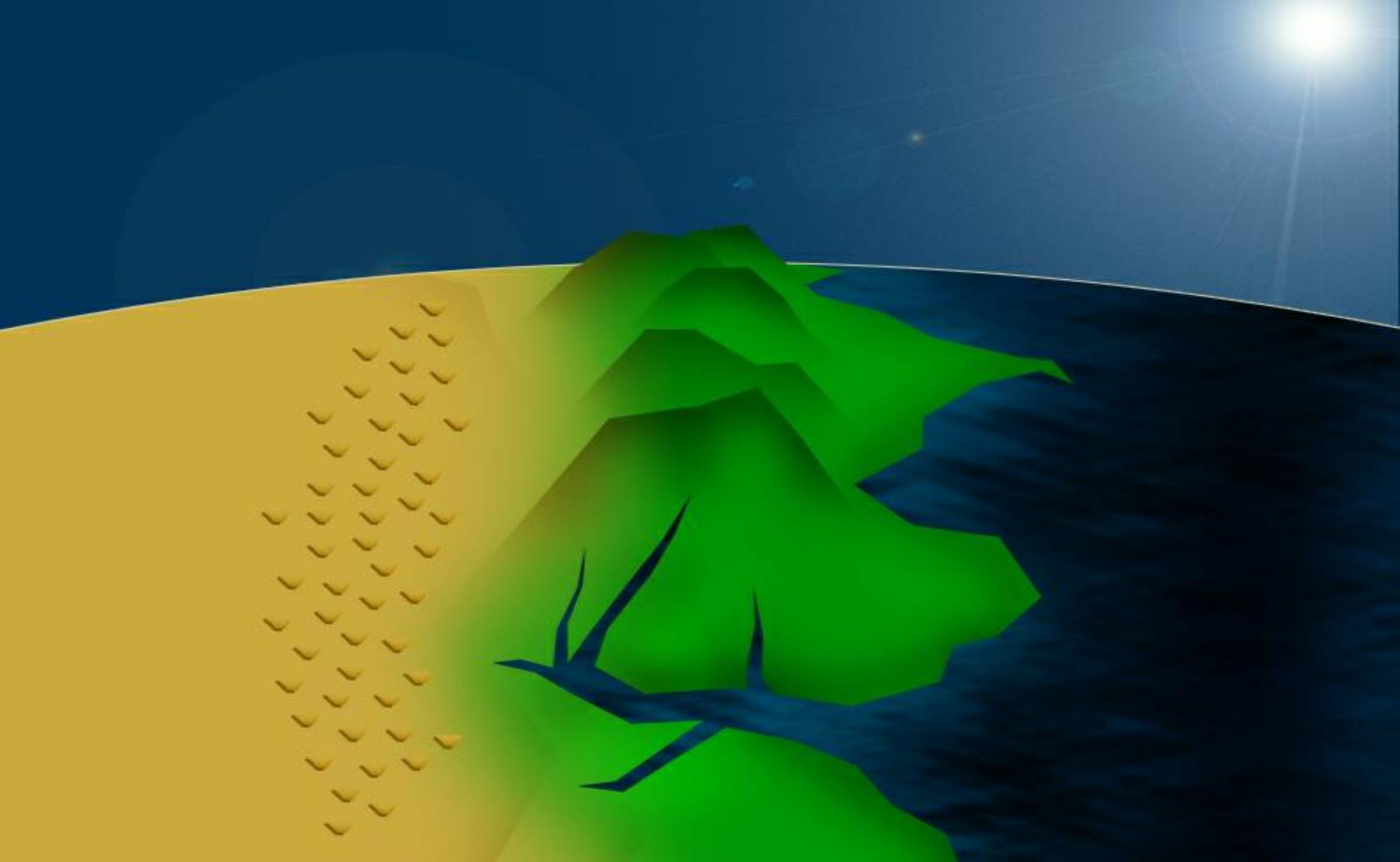
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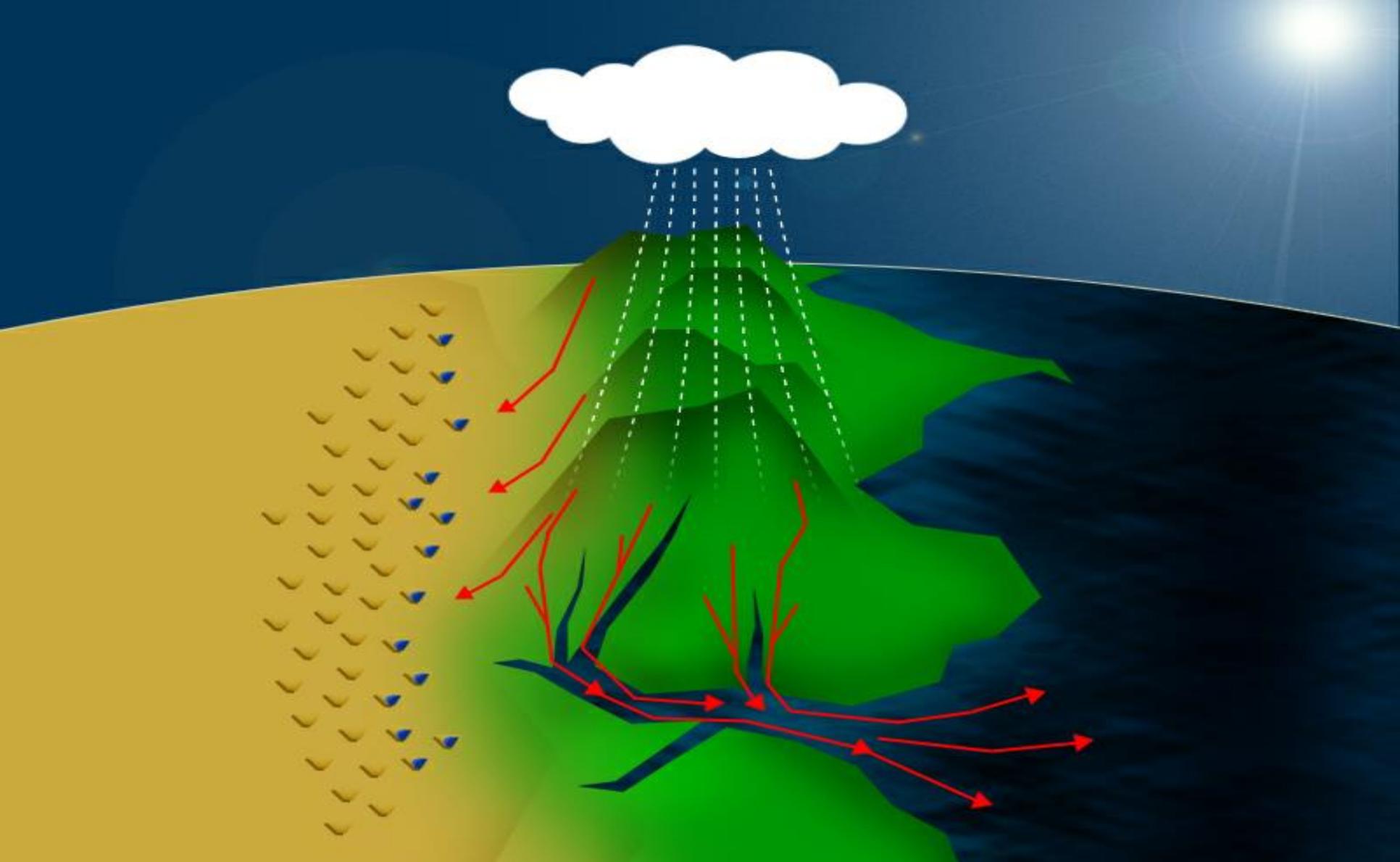
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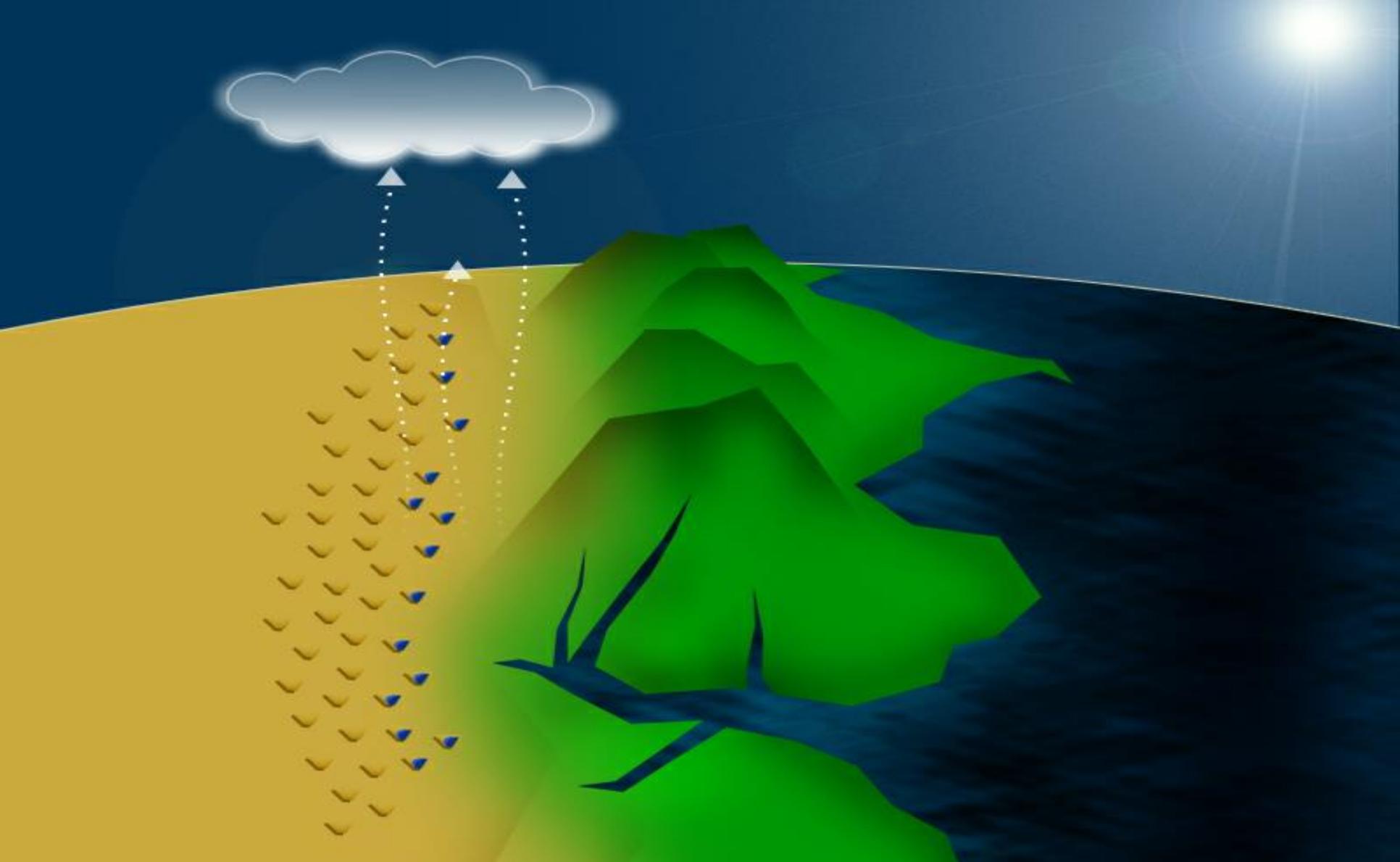
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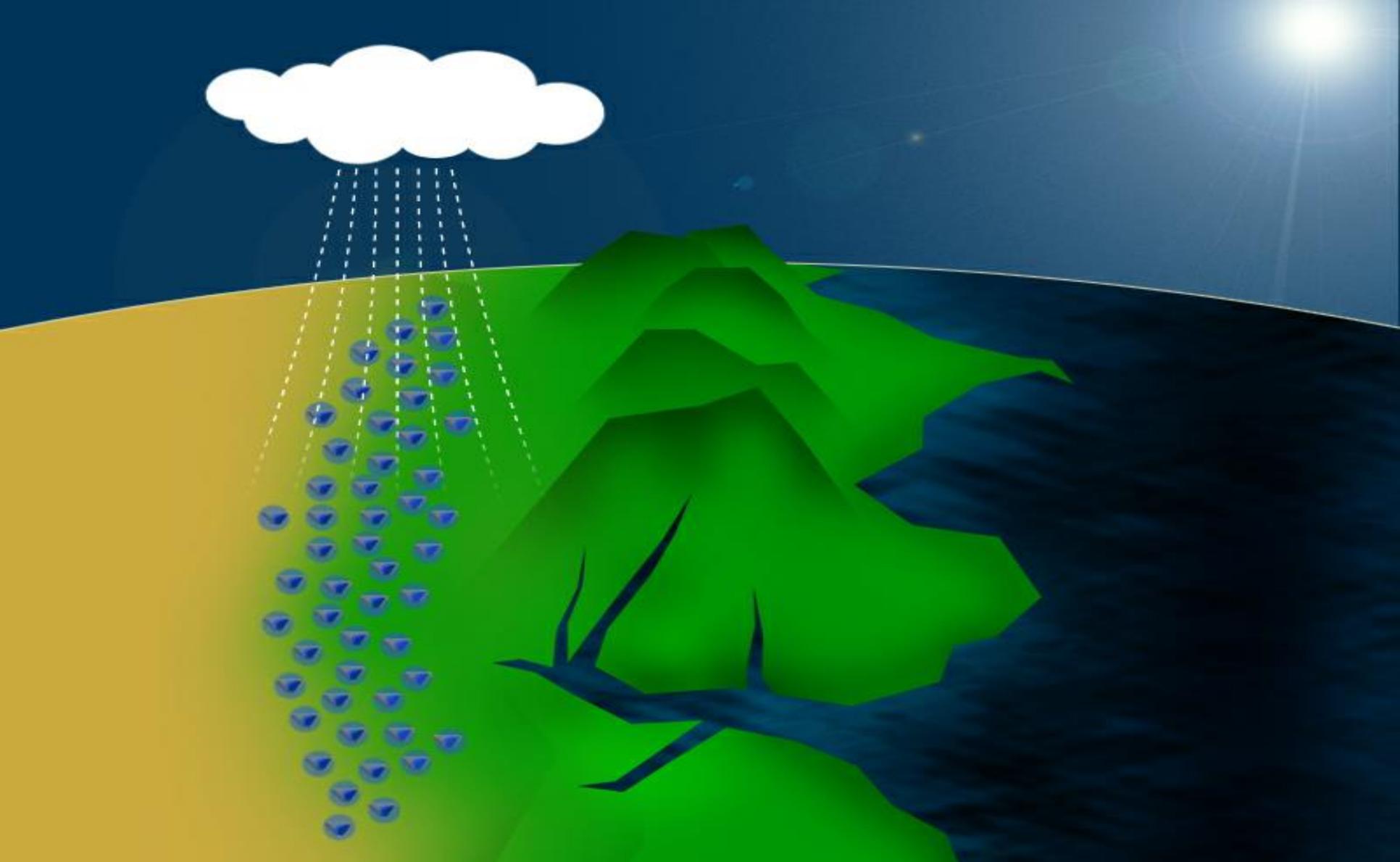
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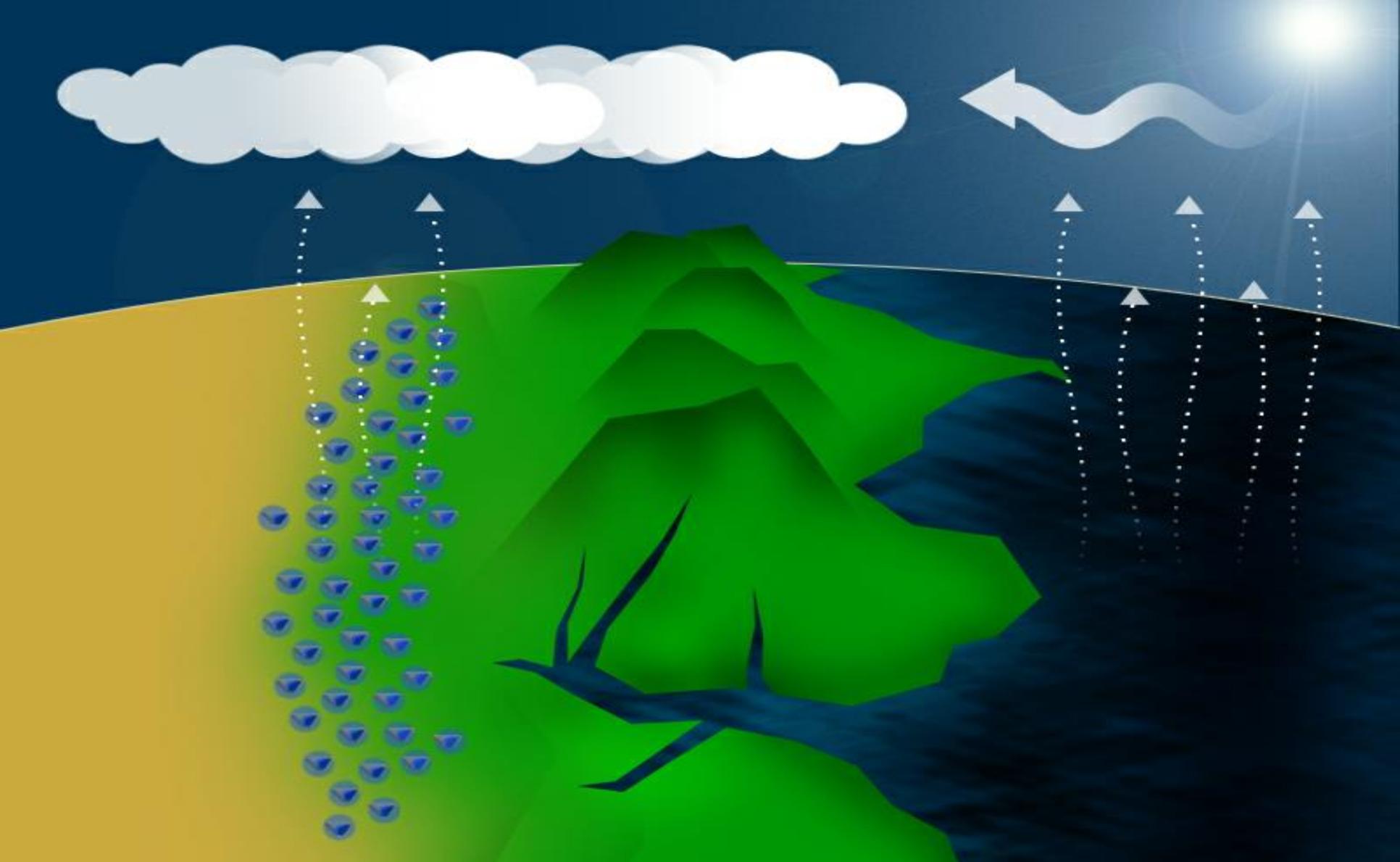
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