

# De zwevende waterbrug

Dr. Elmar C. Fuchs

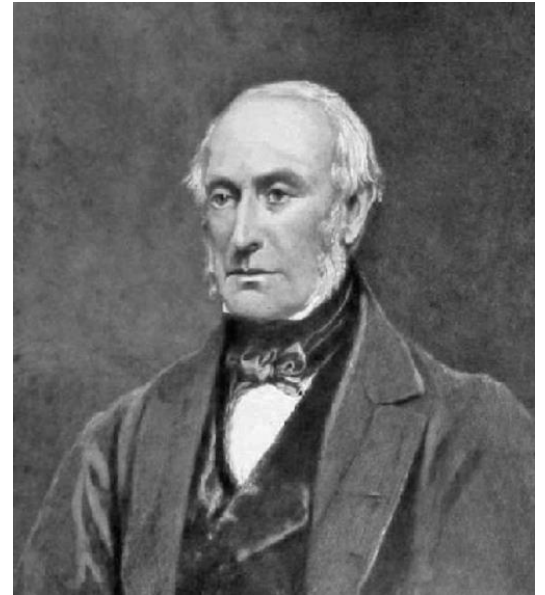
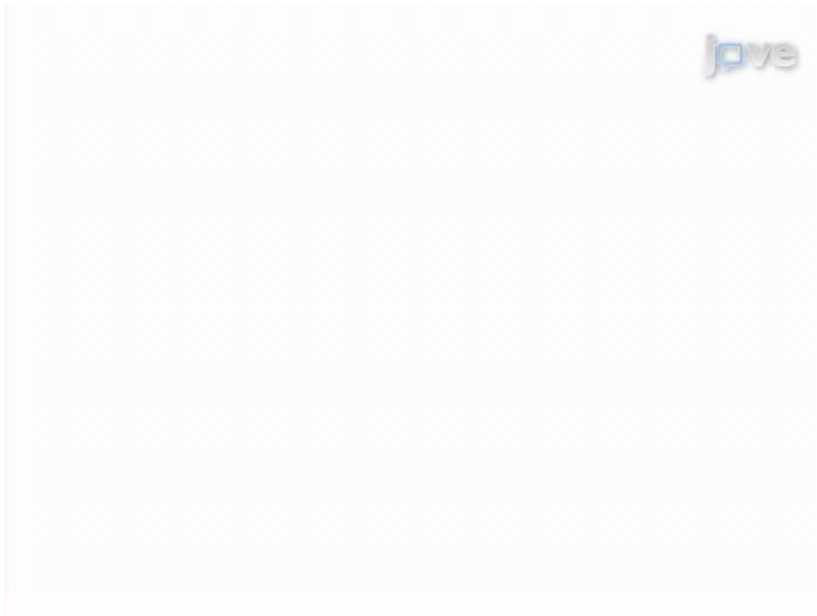
Oerol festival, Terschelling

14 juni 2022

combining scientific excellence with commercial relevance

# The Floating Water Bridge

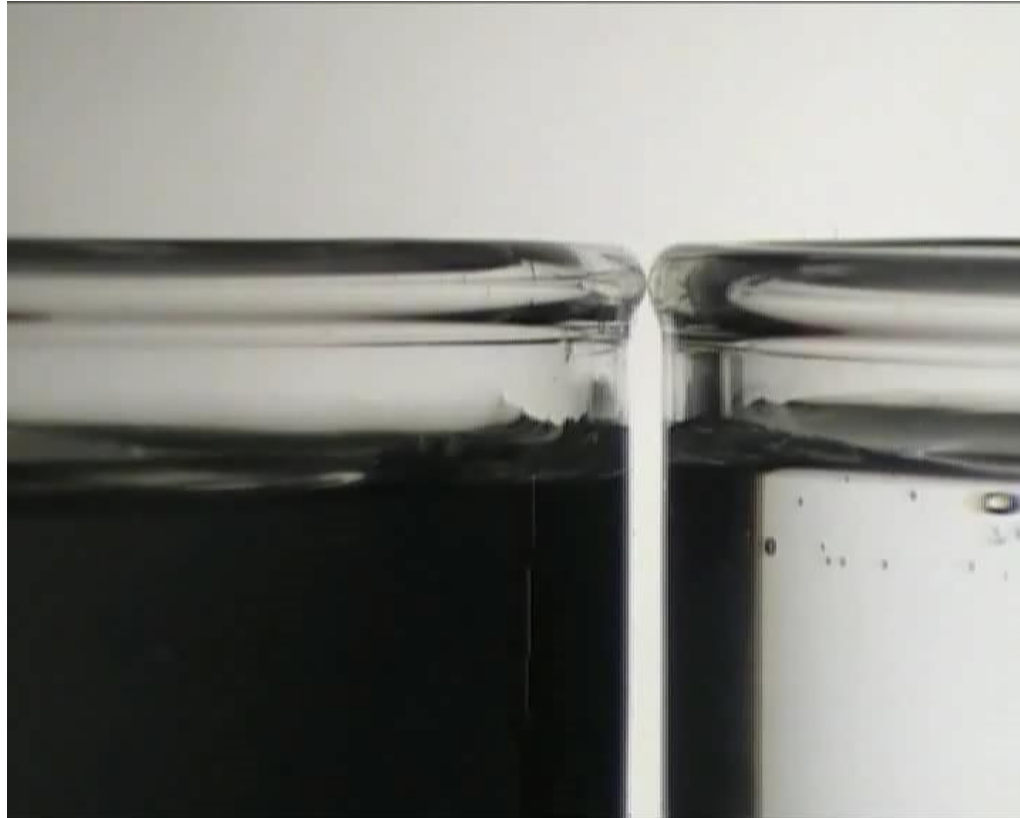
Armstrong, William George, "Electrical Phenomena", in:  
THE ELECTRICAL ENGINEER, Feb 10 (1893) p154-155



Sir William George Armstrong,  
1st Baron Armstrong  
\* November 26, 1810  
† December 27, 1900

# The Floating Water Bridge

Visualisation:  
Sony video camera,  
real time

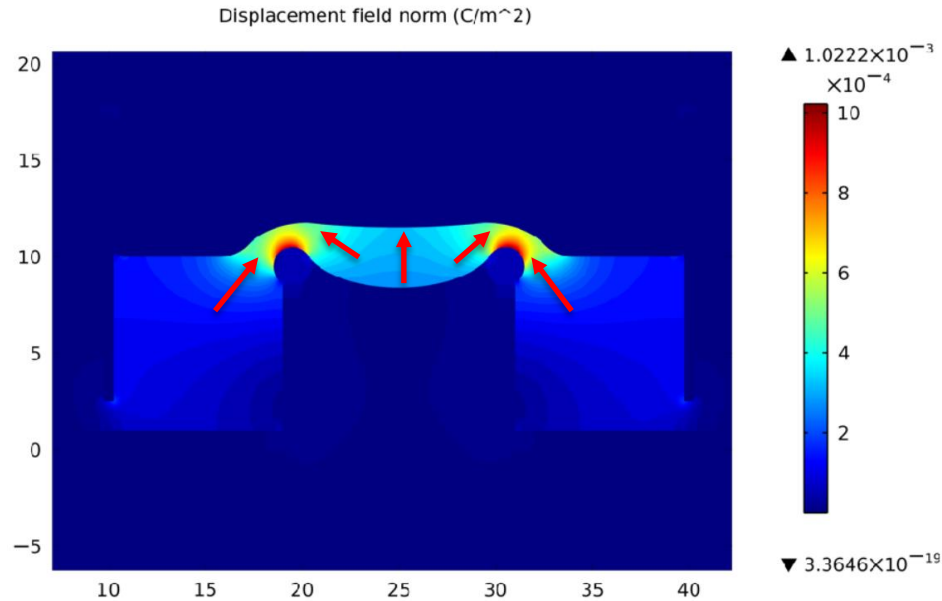


# Electrohydrodynamics / CFD

- Electric field simulation

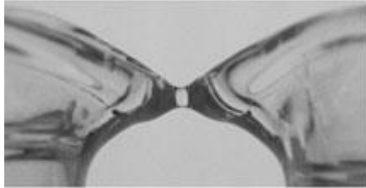
$$\mathbf{E} = -\nabla V$$

$$\mathbf{D} = \varepsilon_0 \varepsilon_r \mathbf{E}$$



# Non-aqueous bridges

(a) Tetrahydrofuran



(b) Dichloromethane



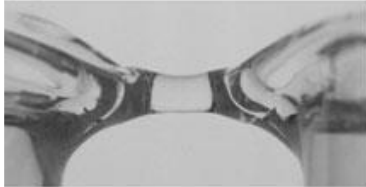
(c) 2-Propanol



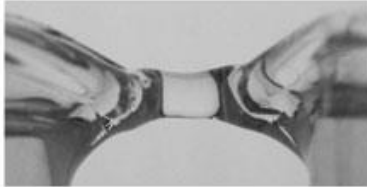
(d) Acetone



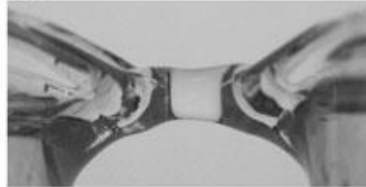
(e) 1-Propanol



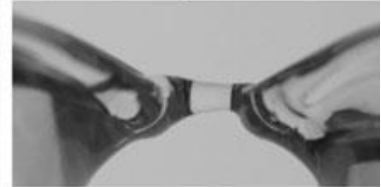
(f) Ethanol



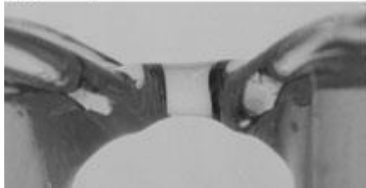
(g) Methanol



(h) Dimethylformamide



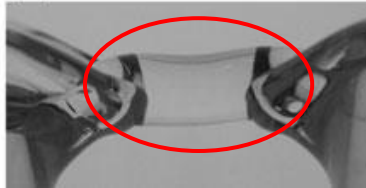
(i) Glycerol



(j) Dimethylsulfoxide



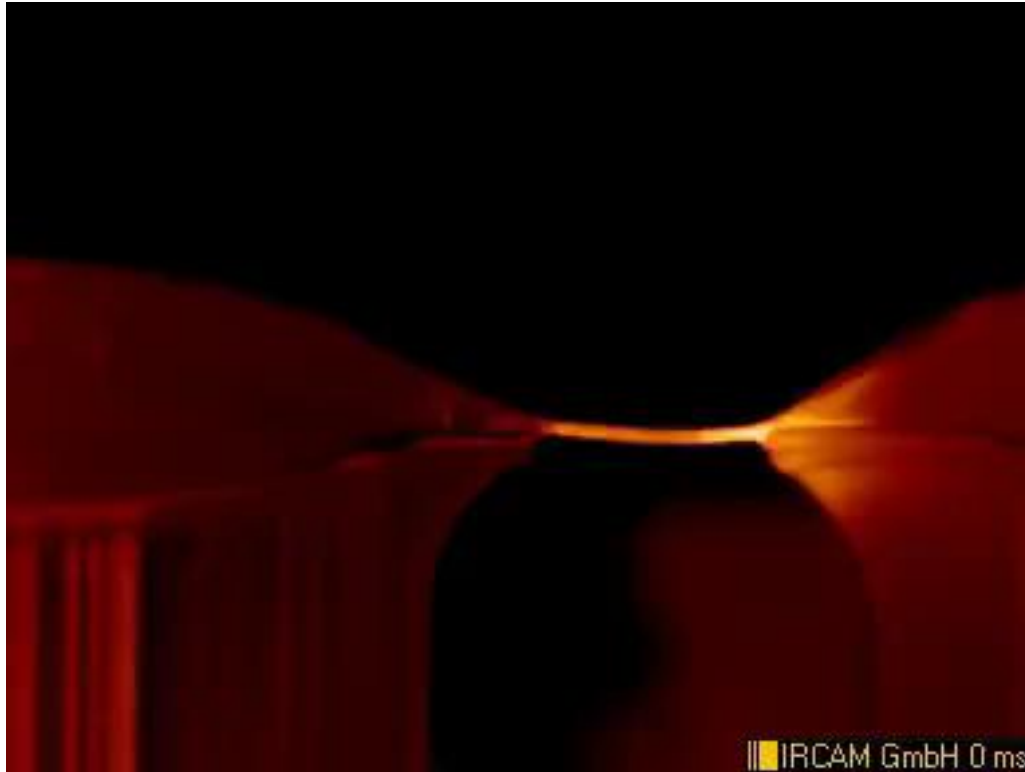
(k) Water



0 5 mm

# Infrared Emission

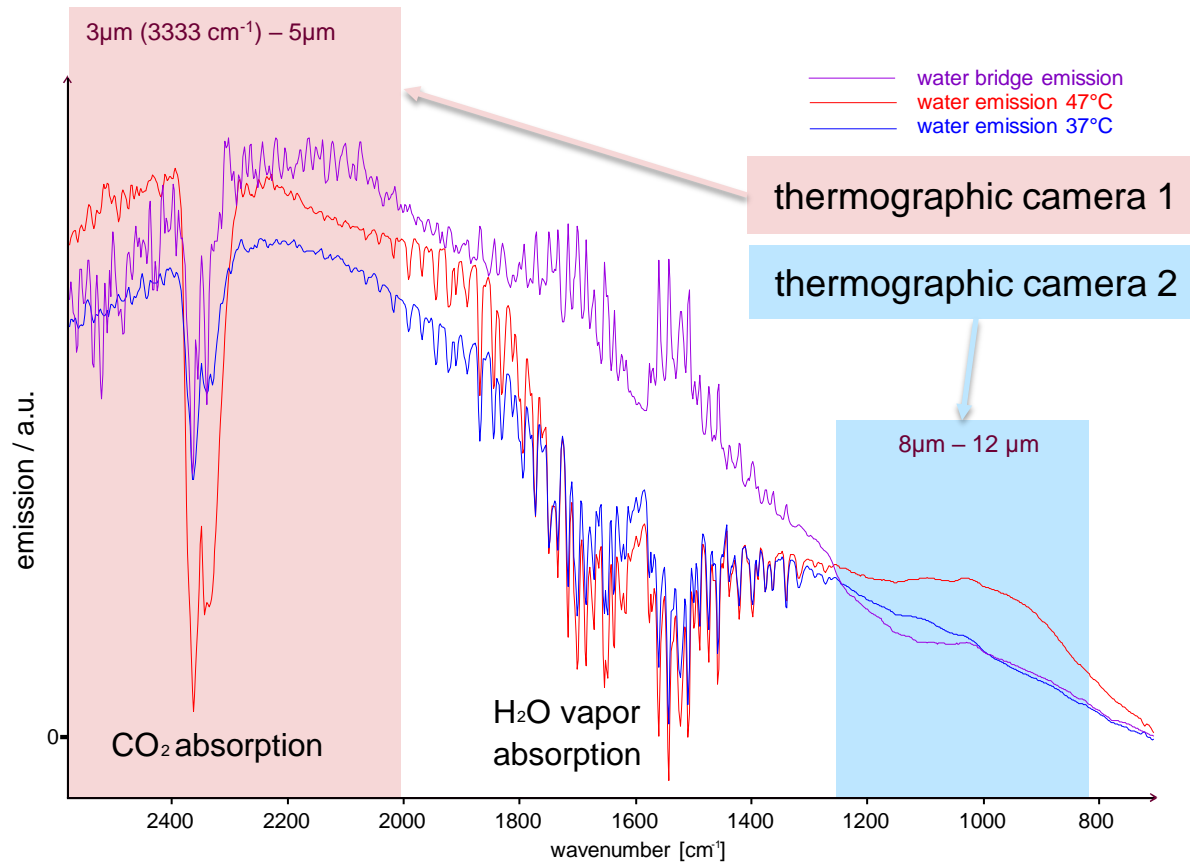
Visualisation:  
IRCAM high speed  
thermographic camera



# Infrared Emission



# Infrared Emission

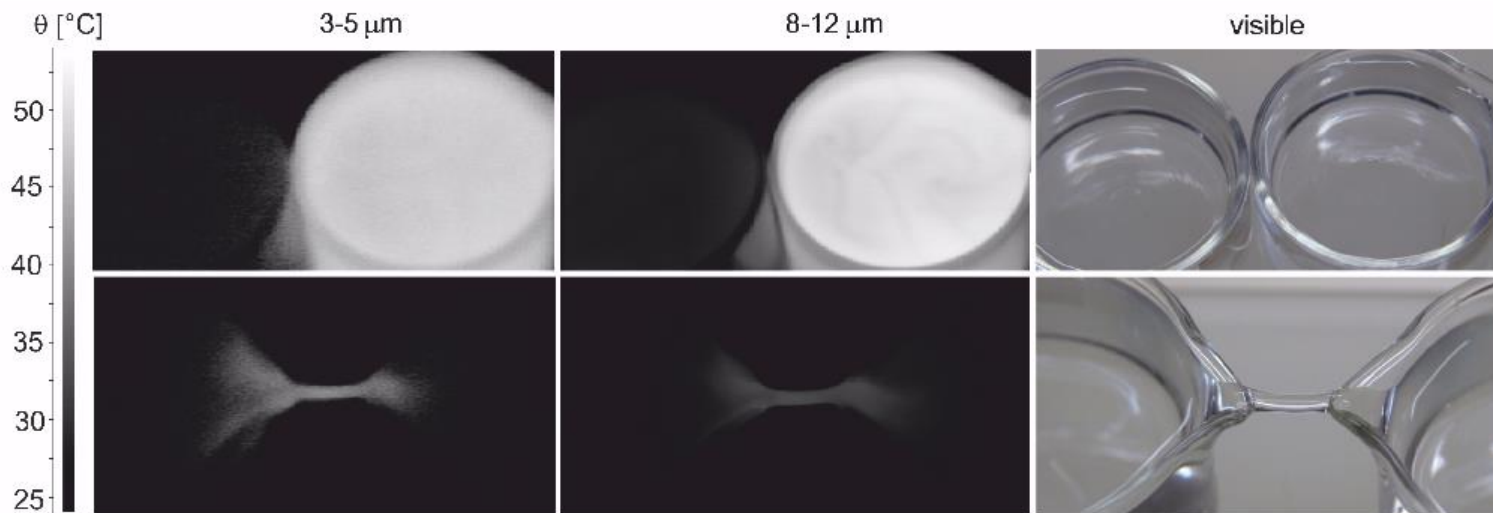




# Infrared Emission

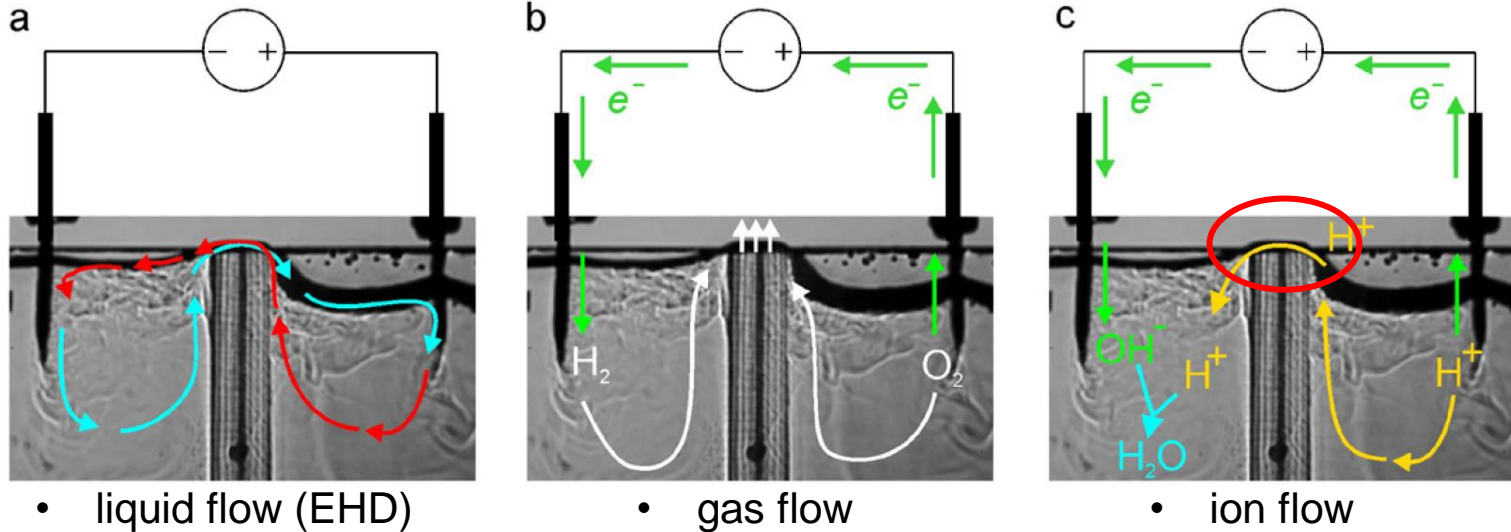
thermographic camera 1

thermographic camera 2



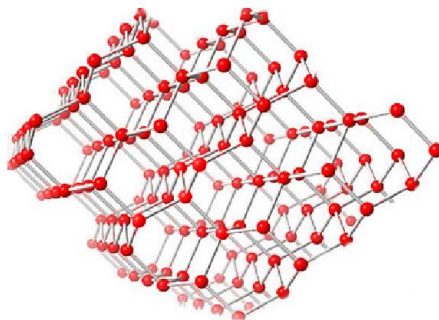
- 3 - 5  $\mu\text{m}$  region is as bright as 47 $^{\circ}\text{C}$ , 8 - 12  $\mu\text{m}$  region as bright as 37  $^{\circ}\text{C}$  water
- There is an additional, non-thermic emission at shorter wavelengths
- This emission is interpreted as result from a protonic band transition

# Proton production, conduction and reduction

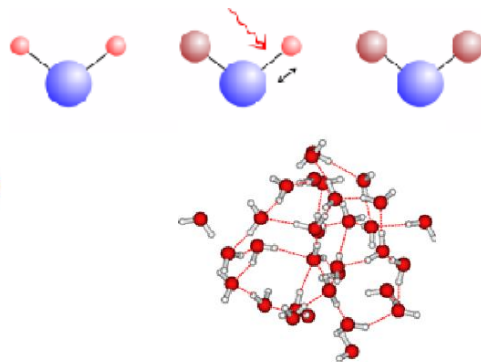


# Ultrafast vibrational energy relaxation

- Measurement of the OH-vibration in an HDO molecule
- Duration of vibration gives information about the H-bond network

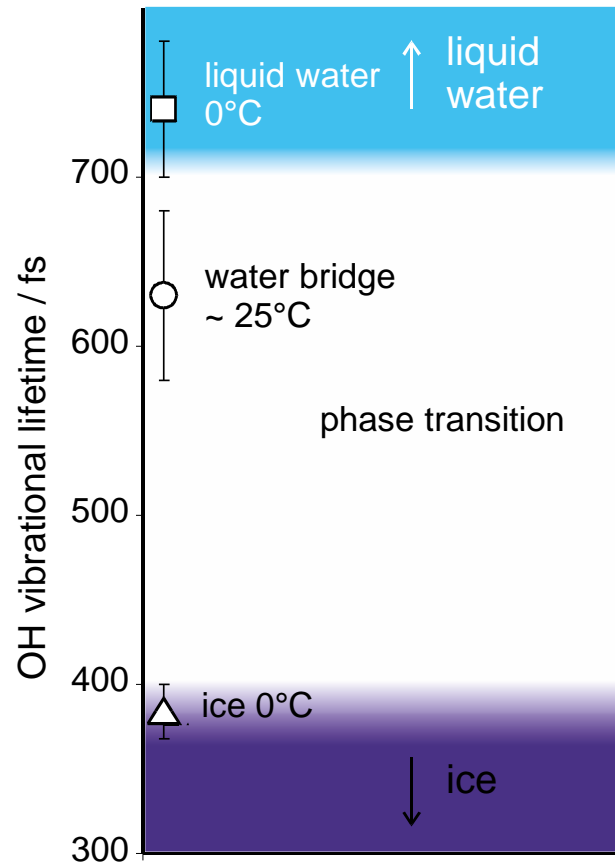


hexagonal ice



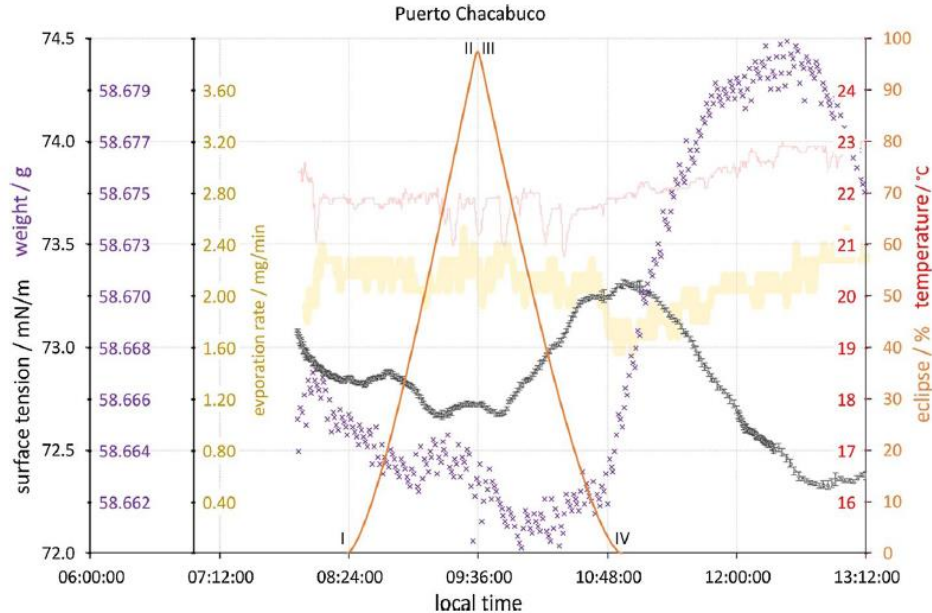
liquid water

- Vibration stops faster in solid phase and lasts longer in liquid phase



# Cosmic influences on terrestrial waters

- Correlation of water properties with solar eclipses



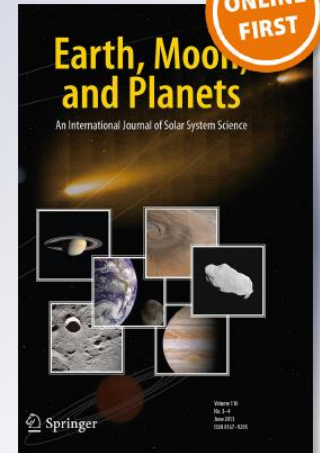
*Solar Eclipses and the Surface Properties of Water*

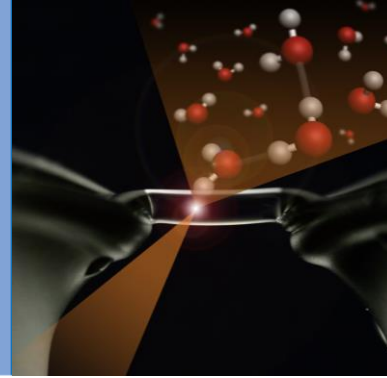
**Elmar C. Fuchs, Gerrit Oudakker,  
Martin Justinek, Nigel Dyer, Jakob  
Woisetschläger, Kevin Godines,  
Matthias Mäder & Friedemann**

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## De zwevende waterbrug

Elmar C. Fuchs

# Hartelijk bedankt voor uw aandacht.

combining scientific excellence with commercial relevance