van Otterloo et al., 2018, Unique occurrence of a folded in-vent dike: New insights on magma-water mixing: Geology, https://doi.org/10.1130/G39794.1.

SUPPLEMENTARY DATA

For understanding the natural system and scaling the experiments the following scaling laws for collapsing sheets and coiling threads have been applied:

$L \sim (\nu u r^2/g)^{0.25}$ Eq. DR1 (Skorobogatiy and Mahadevan 2000, Eq. 8)

$\Pi = H[\rho g/(\eta u r^2)]^{0.25}$ Eq. DR2 (Ribe 2003, Eq. 11)

$B = \rho g H^2/(\eta u)$ Eq. DR3 (Ribe 2003, p. 2)

$\mathrm{Re} = \rho u L/\eta = uL/\nu$ Eq. DR4 (Skorobogatiy and Mahadevan 2000, p. 533)

Where the following parameters are defined:

L – fold wavelength (m)

ν – dynamic viscosity defined as η/ρ (m^2/s)

u – collapse rate (m/s)

r – fold radius or layer thickness (m)

g – gravitational acceleration (9.81 m/s^2)

Π – dimensionless parameter that defines whether collapse is controlled by viscosity ($\Pi < 3.92 \pm 0.04$) or gravity ($\Pi > 3.92 \pm 0.04$)

H – height of the collapsing sheet or thread (m)

ρ – density of the collapsing sheet or thread (kg/m^3)

η – kinematic viscosity of the collapsing sheet or thread (Pa s)

B – buoyancy number, a dimensionless parameter that determines the ratio between sheet thickness (or thread radius) at the top to the thickness (or radius) upon folding

Re – Reynolds number, a dimensionless parameter that defines whether flow is laminar (Re < 500) or turbulent (Re > 2000)

The values for each of the parameters in both the natural and experimental setting are given in Table DR1. The collapse rate for the natural setting was derived from Eq. DR1.

The experiments were geometrically scaled by a factor of $\lambda = l_{model}/l_{nature}$ 0.1 – 0.01, where l is length. Both the natural and experimental settings were in the gravity-controlled folding

regime as indicated by Π. Since Re << 500 in both settings, they are dynamically similar and within the laminar flow regime.

Parameter	Nature	Experiment	Unit
L	0.08–0.12	0.004	m
ν	$(0.36–3.6) \times 10^{-2}$	50	m^2/s
u	0.1–1	$(3–4) \times 10^{-2}$	m/s
r	0.04–0.06	0.001	m
g	9.81	9.81	m/s^2
Π	505–839	10.1	-
H	30	0.20	m
ρ	2780	965	kg/m^3
η	$10^2–10^3$	4.8×10^4	Pa s
B	$(25–73) \times 10^4$	0.26	-
Re	0.621–4.72	4.06×10^{-12}	-

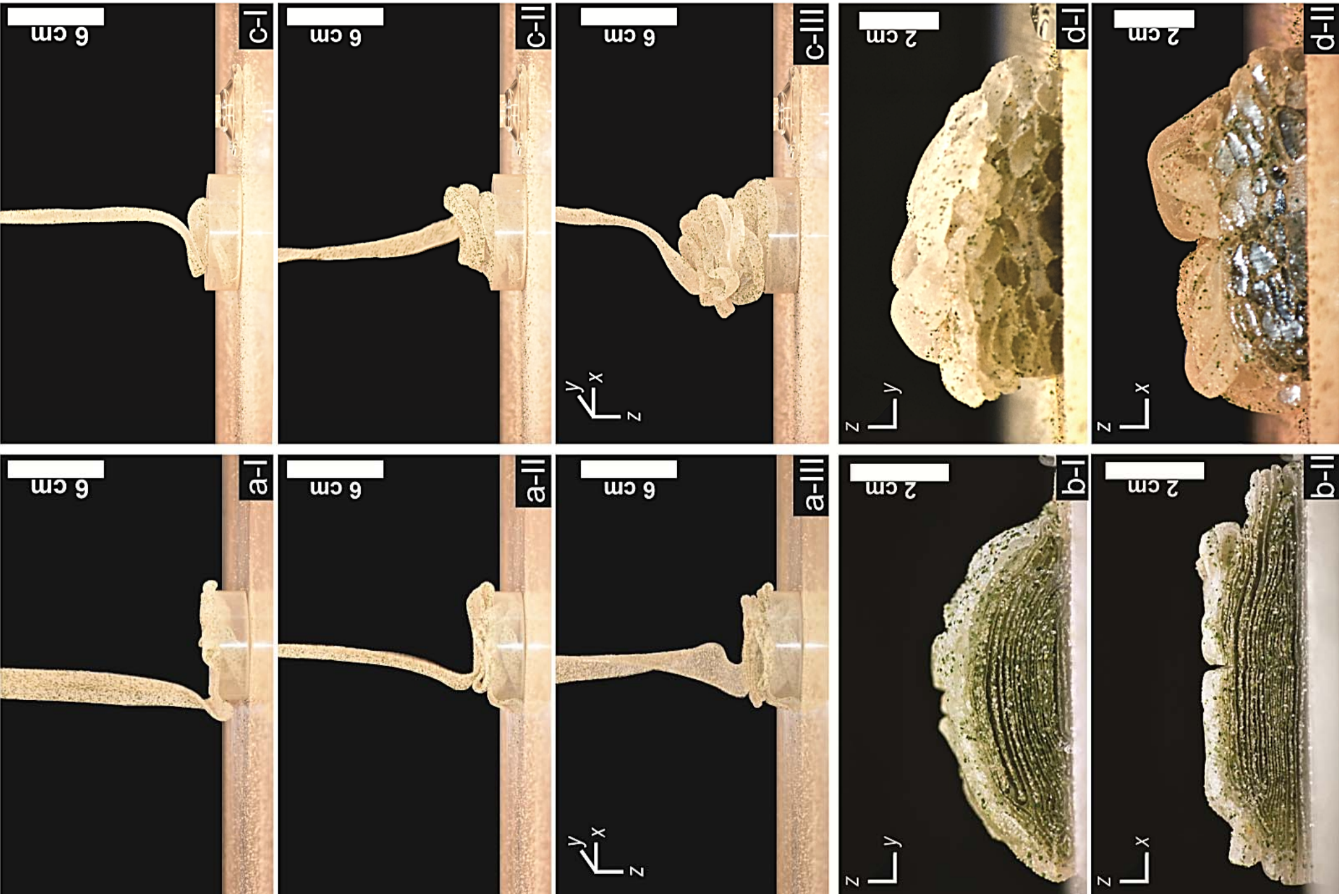
Table DR1 – Parameters as determined from the field and the experiments either by measurement or by calculation using equations DR1–-DR4.

REFERENCES

Ribe, N., M., 2003, Periodic folding of viscous sheets, Physical Review E, 68, 036305.

Skorobogatiy, M., and Mahadevan, L., 2000, Folding of viscous sheets and filaments, Europhysics Letters, v. 52, no. 5, p. 532-538.

Figure DR1


a-I
6 cm
a-II
6 cm
a-III
6 cm
y
x
z
b-I
2 cm
z
y
b-II
2 cm
z
x
c-I
6 cm
c-II
6 cm
c-III
6 cm
y
x
z
d-I
2 cm
z
y
d-II
2 cm
z
x