PhotoMOB

An automated tool for fractional bed mobility analysis in gravel bed rivers
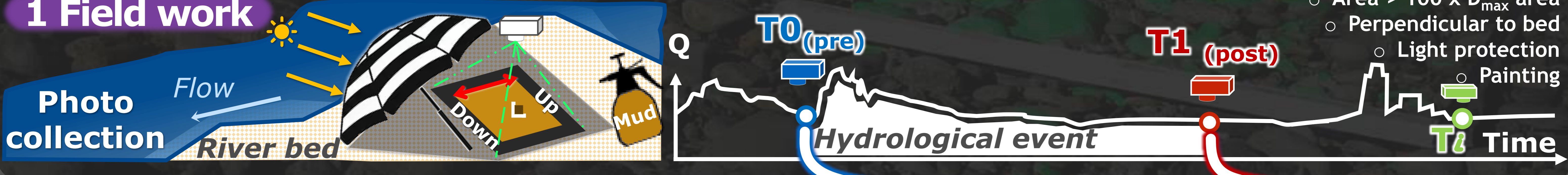
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Objective

Study of the dynamics using a close-range photographic method:

> Systematic and semi-automated
> Accurate and precise

> Compatible with other measurement methods
> Common tool used → GIS

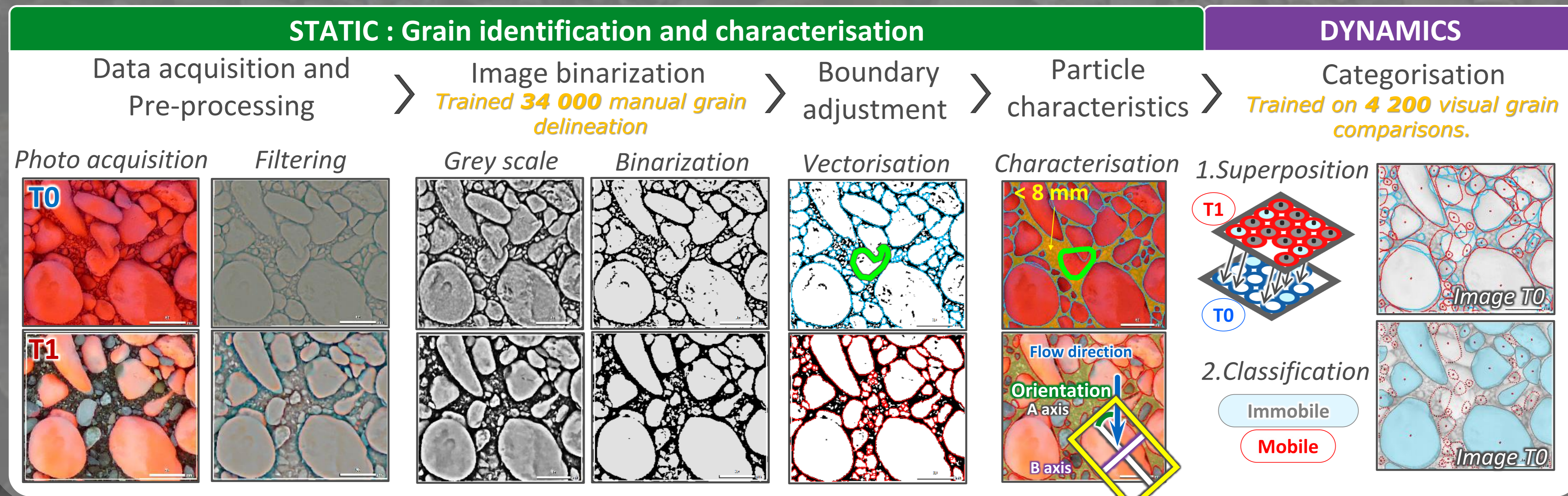## 1 Field work

Photo collection

Flow — River bed — Down — L — Up — Mud

Q — T0 (pre) — Hydrological event — T1 (post) — Ti — Time

- Area > 100 x D_{max} area
- Perpendicular to bed
- Light protection
- Painting

2 Method: PhotoMOB — ArcGIS Toolbox — Image processing

PhotoMOB

STATIC : Grain identification and characterisation				DYNAMICS
Data acquisition and Pre-processing	Image binarization — Trained **34 000** manual grain delineation	Boundary adjustment	Particle characteristics	Categorisation — Trained on **4 200** visual grain comparisons.

Photo acquisition | Filtering | Grey scale | Binarization | Vectorisation | Characterisation < 8 mm | 1. Superposition — T1 — T0 — Image T0 | 2. Classification — Immobile — Mobile — Image T0

T0 / T1

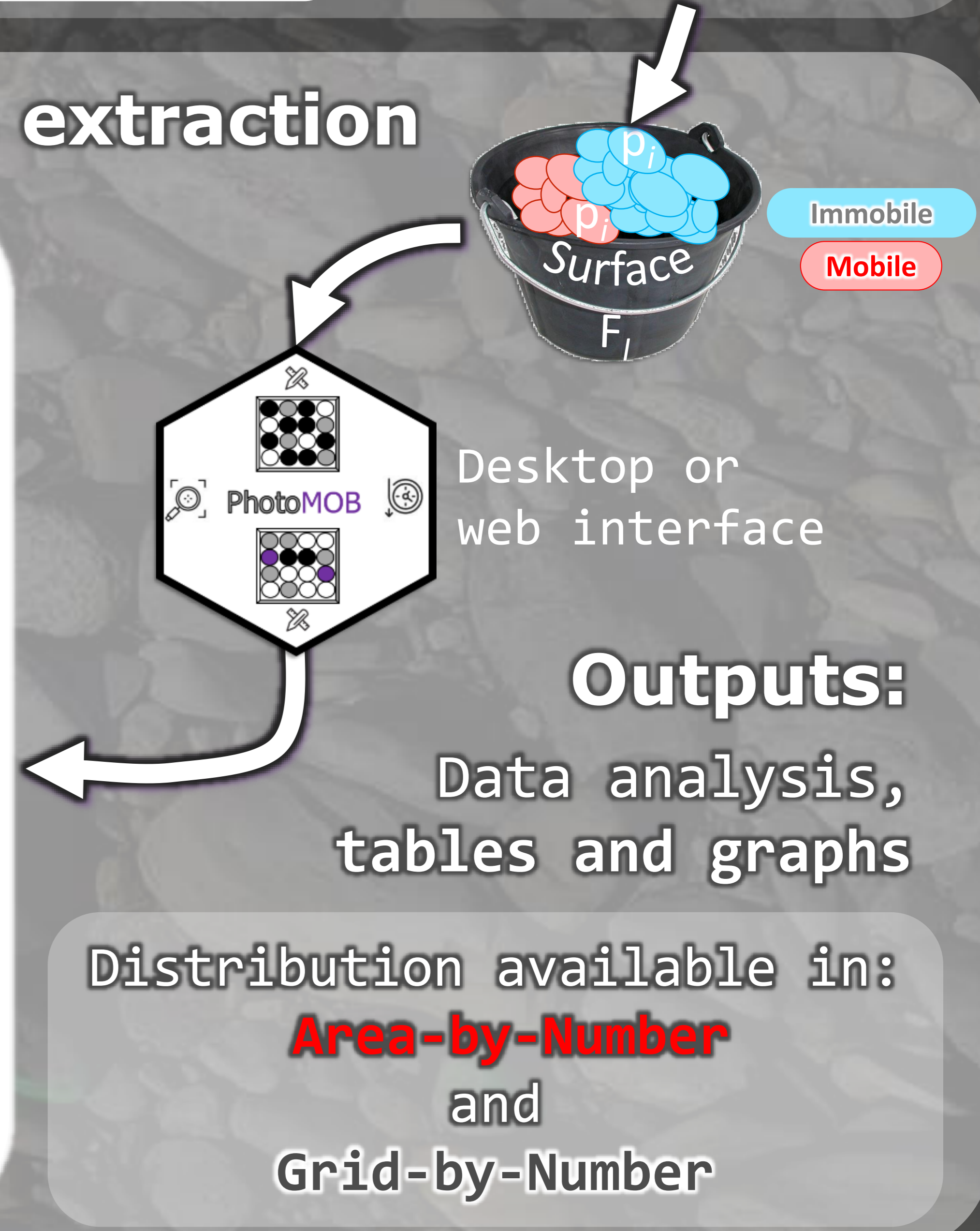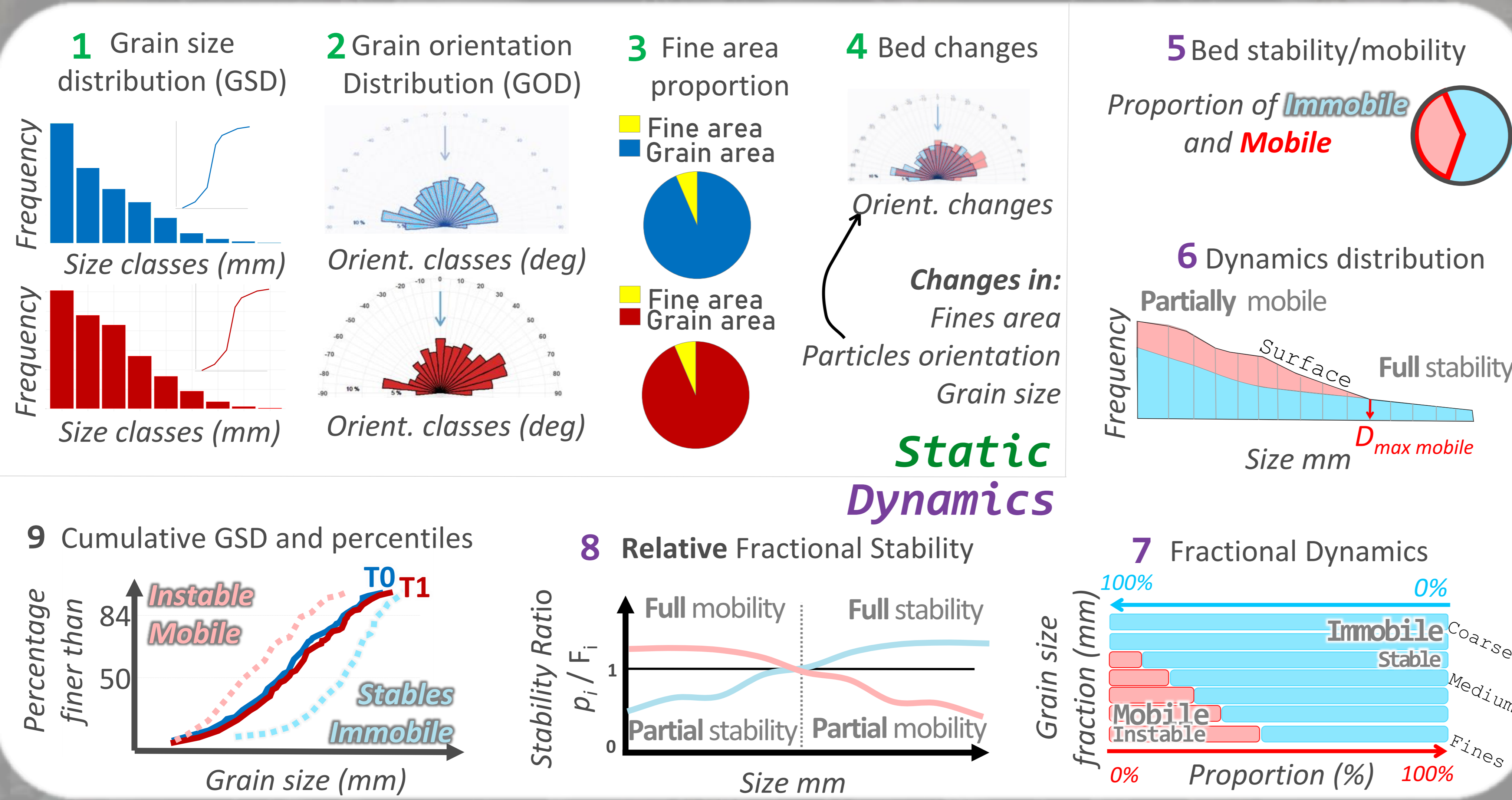Flow direction — Orientation — A axis — B axis

more than 620 successive actions

Outputs

Pre and post shapefile layers + attributes

3 Outcomes: Results — PhotoMOB Extractor App — Data extraction

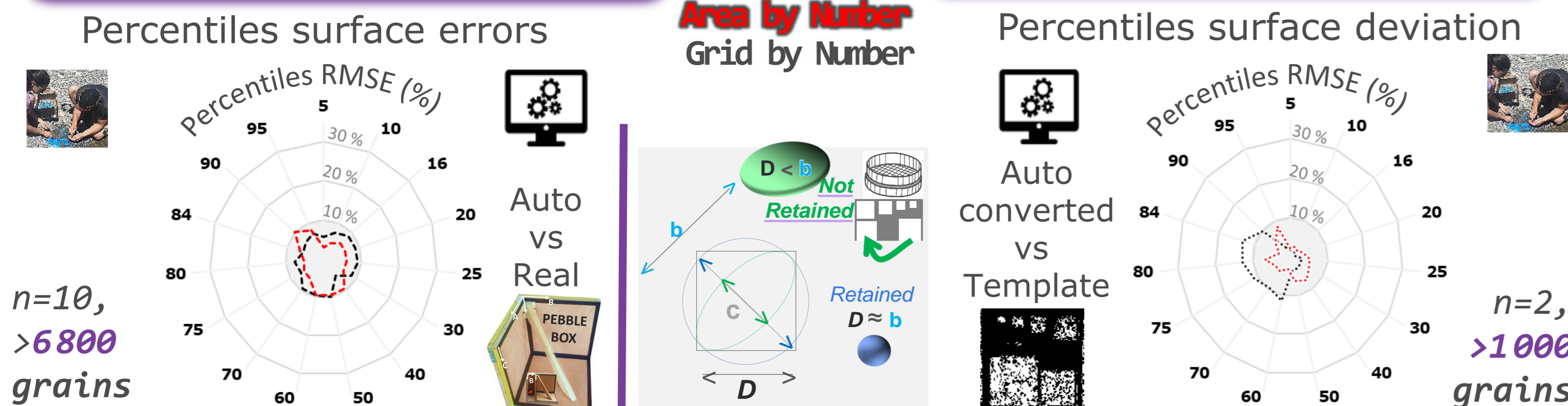**1** Grain size distribution (GSD)
Frequency — Size classes (mm)

2 Grain orientation Distribution (GOD)
Orient. classes (deg)

3 Fine area proportion
Fine area — Grain area

4 Bed changes
Orient. changes — Changes in: Fines area, Particles orientation, Grain size

5 Bed stability/mobility
Proportion of *Immobile* and *Mobile*

6 Dynamics distribution
Frequency — Partially mobile — Surface — Full stability — Size mm — $D_{max\ mobile}$

Static
Dynamics

9 Cumulative GSD and percentiles
Percentage finer than — 84 — 50 — Instable Mobile — Stables Immobile — T0 — T1 — Grain size (mm)

8 **Relative** Fractional Stability
Stability Ratio p_i / F_i — Full mobility — Full stability — Partial stability — Partial mobility — Size mm

7 Fractional Dynamics
Grain size fraction (mm) — 100% — 0% — Immobile Stable — Coarse — Medium — Fines — Mobile Instable — Proportion (%) — 0% — 100%

Surface — Immobile — Mobile — F_i — P_i — D_i

PhotoMOB — Desktop or web interface

Outputs: Data analysis, tables and graphs

Distribution available in: **Area-by-Number** and **Grid-by-Number**

4 Bed texture dynamics

Ésera river (South Pyrenees) Autumn 2020

E5 — E9 — E2 — E1 — E6 — Stable — Mobile

E1 | E2 | E5 | E6 | E9

5 Performances

GSD form: **Area by Number** / Grid by Number

Percentiles surface errors
Percentiles RMSE (%)
90 95 — 30% 10 — 16
84 — 20% — 25
80 — 10% —
75 — — 40
70 60 — 50
Auto vs Real
PEBBLE BOX
n=10, >6800 grains

6 Compatibility

Percentiles surface deviation
Percentiles RMSE (%)
90 95 — 30% 10 — 16
84 — 20% — 25
80 — 10% —
75 — — 40
70 60 — 50
Auto converted vs Template
D ≈ b — Not Retained — Retained D ≈ b — D
n=2, >1000 grains

Performance analysis indicates that deviation from control GSD (**real axes** or **sieved measurements**) are generally **less than 10%**

PhotoMOB allow extracting accurate **GSD** of gravel bed rivers and other properties of the bed texture as **orientation** and the proportion of **fine** particles.
If diachronic photos are obtained, bed **disturbance** can be assessed, identifying and quantifying the particle (size) that remain **stable** (or disturbed) and their proportion

Conclusion

Visit the web site:
https://shiny.fannyville.com/
to have more info's or scan the QR codes below

Toolbox | App