

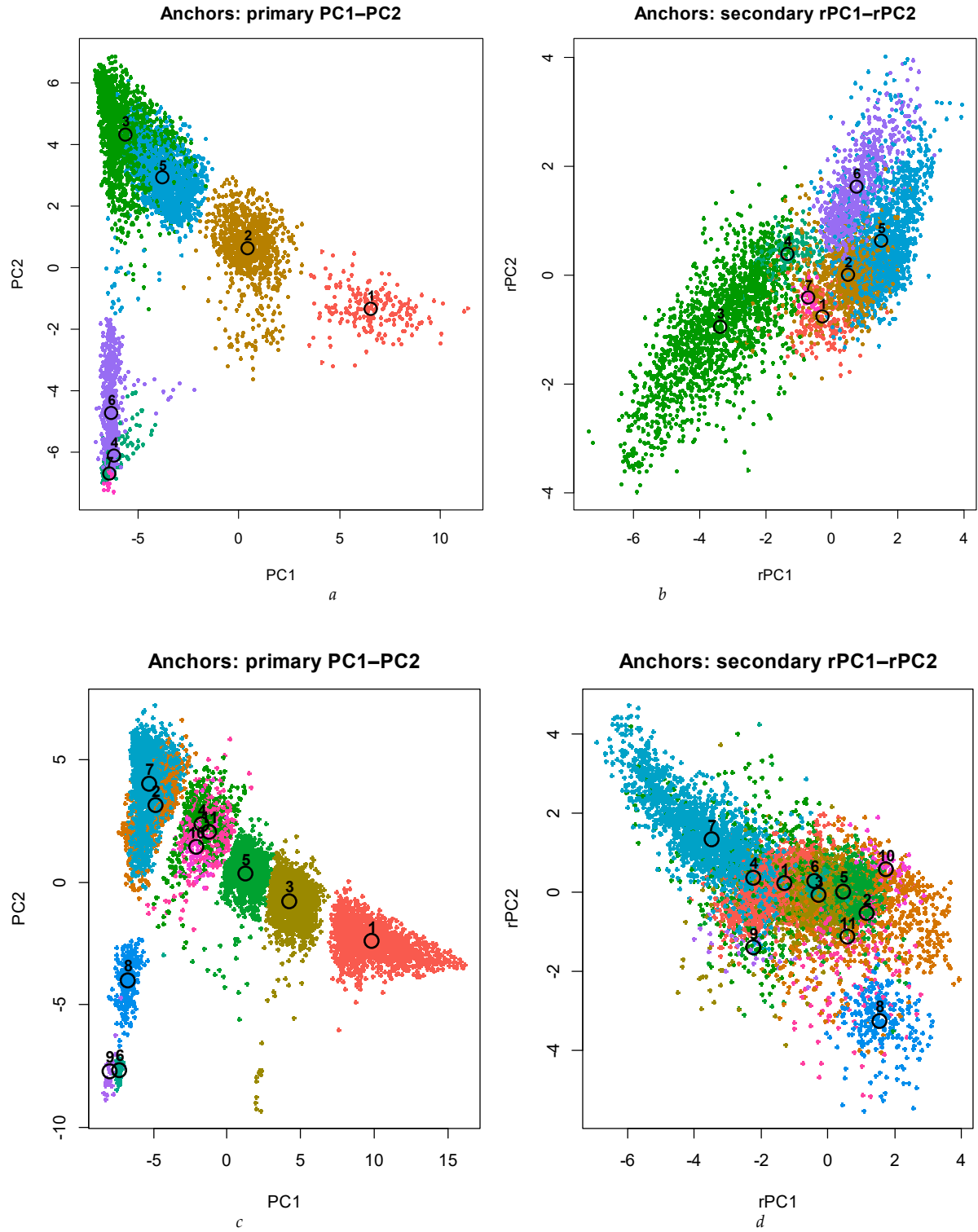


Figure S1. Distribution of anchor pixels representing land-surface types identified by cluster analysis and projected onto the space of the first two primary (a, c) and the first two secondary (b, d) principal components (a, b: 9–14 July 2024, and c, d: 8–13 August 2025).

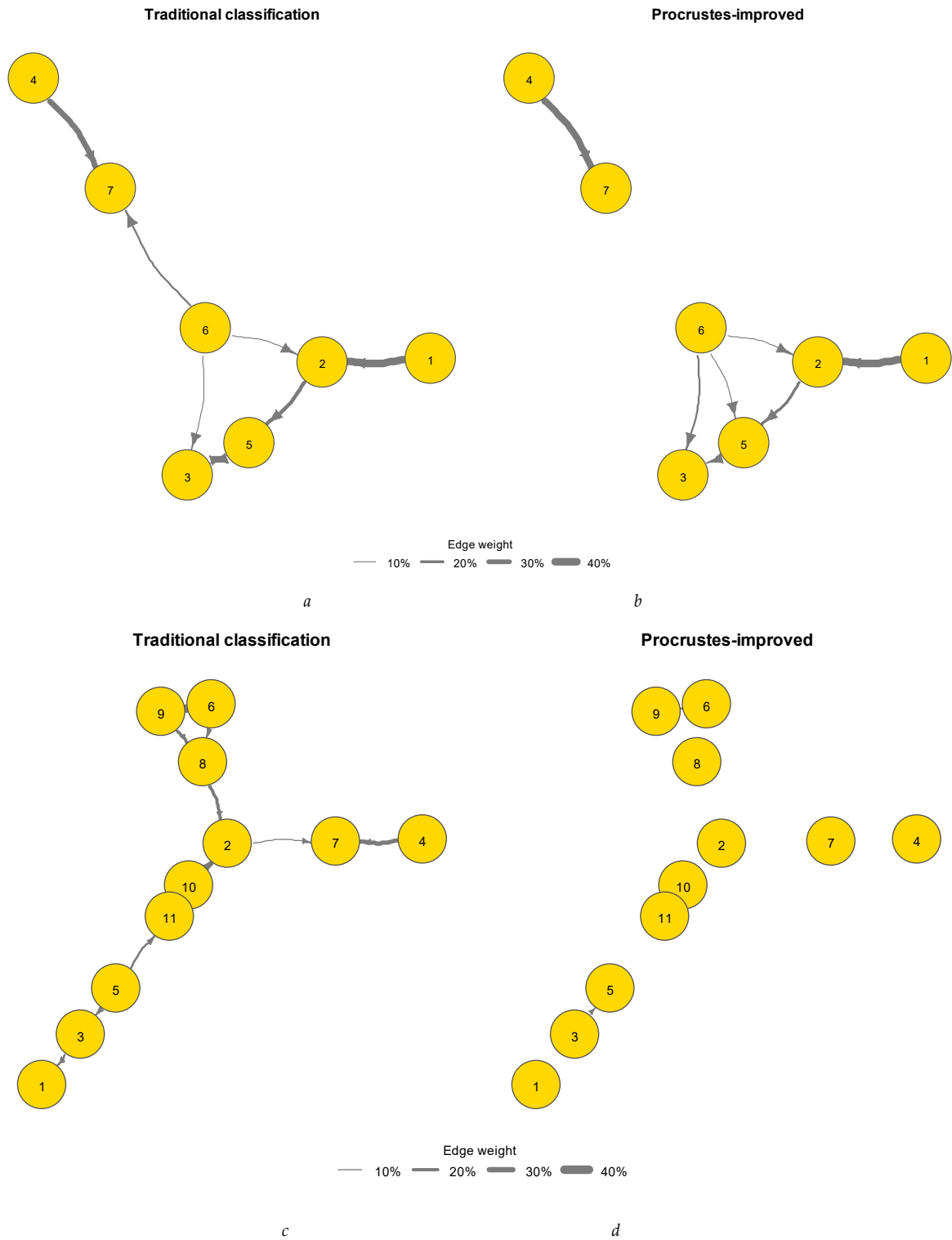


Figure S2. Transition-matrix visualization for the traditional method (a, c) and the Procrustes-improved method (b, d); only transitions with probabilities >10% are shown (a, b: 9–14 July 2024, and c, d: 8–13 August 2025).

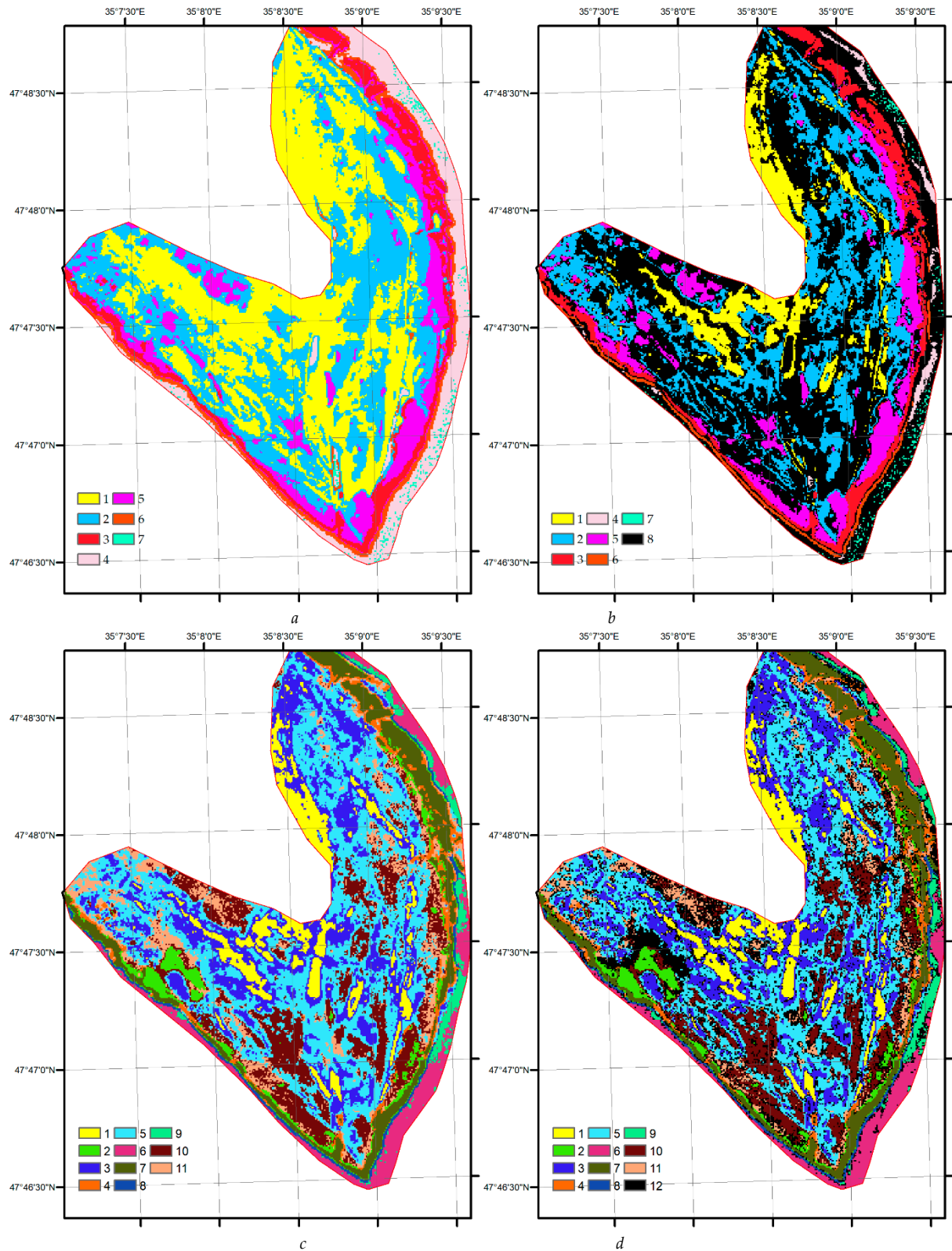


Figure S3. Spatial variation in cluster distribution: the configuration for the initial period is shown on the right, whereas the configuration of pixels that retained their cluster assignment is shown on the left; pixels that changed their cluster assignment (the last pseudo-cluster) are shown in black (a, b: 9–14 July 2024; c, d: 8–13 August 2025). Type definitions (9–14 July 2024): 1 – Q51D2 – *Typha angustifolia* beds normally without free-standing water and Q511 – *Phragmites australis* beds and F9.35 – Riparian stands of invasive shrubs; 2 – T11 – Temperate *Salix* and *Populus* riparian forest and E5.43 – Shady woodland edge fringes; 3 – C3.6 – Unvegetated or sparsely vegetated shores with soft or mobile sediments and R11 – Pannonian and Pontic sandy steppe; 4 – C2.3 – Permanent non-tidal, smooth-flowing watercourses and C3.61 – Unvegetated river sand banks; 5 – T13 – Temperate hardwood riparian forest and C3.5132 – Swards of small *Cyperus* species; 6 – C3.53 – Euro-Siberian annual river mud communities; 7 – Q61 – Periodically exposed shore with stable, eutrophic sediments with pioneer or ephemeral vegetation;

8–13 August 2025): 1 – Q511 – *Phragmites australis* beds and F9.35 – Riparian stands of invasive shrubs; 2 – R11 – Pannonian and Pontic sandy steppe; 3 – T11 – Temperate *Salix* and *Populus* riparian forest and Q51D2 – *Typha angustifolia* beds normally without free-standing water; 4 – Q61 – Periodically exposed shore with stable, eutrophic sediments with pioneer or ephemeral vegetation; 5 – E5.43 – Shady woodland edge fringes; 6 – C2.3 – Permanent non-tidal, smooth-flowing watercourses; 7 – C3.6 – Unvegetated or sparsely vegetated shores with soft or mobile sediments; 8 – C3.53 – Euro-Siberian annual river mud communities; 9 – C3.61 – Unvegetated river sand banks; 10 – T13 – Temperate hardwood riparian forest; 11 – C3.5132 – Swards of small *Cyperus* species.