390

Nanometer-scale imaging and microsecond-range tracking with the Abberior MINFLUX

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Abstract

In MINFLUX, single fluorophores are localized by reading out the fluorescence signal at pre-defined positions in its vicinity. Using a donut-shaped excitation focus allows to determine the localization of the fluorophores with a minimal number of photons and consequently within a spatio-temporal regime exceeding alternative techniques [1, 2]. Until now, microscopy techniques with such a performance were unfortunately only usable by experts in the field of optics.

The *abberior* MINFLUX microscope makes this outstanding technology accessible to a broad range of scientists. This microscope combines highest localization precisions with standard workflows allowing non-experts to apply this technique. MINFLUX nanoscopy provides localization precisions below 2 nm in 2D and isotropic localizations precisions below 2.5 nm in 3D [3]. Together with the option to do multi-color imaging it facilitates colocalization analysis in the nanometer range and will allow to address numerous biomedical and biophysical questions on the molecular scale. We will demonstrate the imaging capabilities of the *abberior* MINFLUX microscope in the nanoscale using a cell-biological sample.

Applying the MINFLUX principle for single particle tracking, the movements of single fluorophores can be followed with a temporal resolution of more than 8 kHz [3]. By using a central minimum in the excitation beam, the emitted fluorescence is kept minimal, which allows MINFLUX to achieve its localization with a very small number of photons. The performance of the *abberior* MINFLUX microscope in single particle tracking will be presented by tracing dye-coupled lipids in lipid membranes.

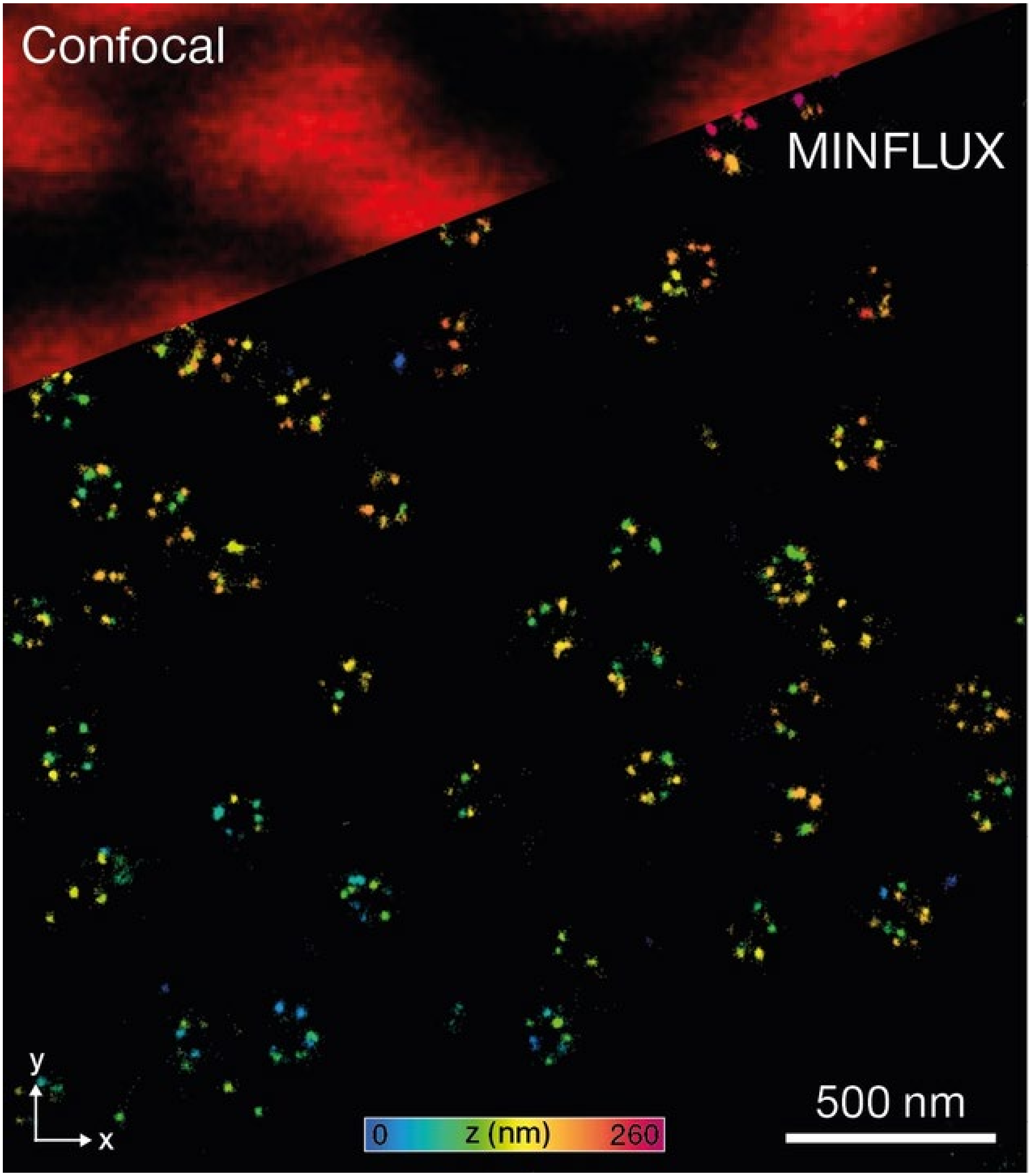

Figure 1. Confocal and 3D MINFLUX images of a nuclear pore complex sample.

References

[1] Balzarotti et al. (2017) Nanometer resolution imaging and tracking of fluorescent molecules with minimal photon fluxes. Science **355**, 606–612.

[2] Gwosch et al. (2020) MINFLUX nanoscopy delivers 3D multicolor nanometer resolution in cells. Nature Methods, 17(2), 217–224.

[3] Schmidt et al. (2021) MINFLUX nanometer-scale 3D imaging and microsecond-range tracking on a common fluorescence microscope. Nat. Commun. 12(1):1478.