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Principal spectral theory and asynchronous exponential growth for age-structured models with nonlocal diffusion of Neumann type

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We study the principal spectral theory and asynchronous exponential growth for age-structured models with nonlocal diffusion of Neumann type. First, we provide two general sufficient conditions to guarantee existence of the principal eigenvalue of the age-structured operator with nonlocal diffusion. Then we show that such conditions are also enough to ensure that the semigroup generated by solutions of the age-structured model with nonlocal diffusion exhibits asynchronous exponential growth. Compared with previous studies, we prove that the semigroup is essentially compact instead of eventually compact, where the latter is usually obtained by showing the compactness of solution trajectories. Next, following the technique developed in Vo (*Math. Nach.* 2022) we obtain some limit properties of the principal eigenvalue with respect to the diffusion rate and diffusion range. Finally, we establish the strong maximum principle for the age-structured operator with nonlocal diffusion. (Based on H. Kang & S. Ruan, *Math. Ann.* 2022).