

Non-ergodic one-magnon magnetization dynamics in flat-band frustrated antiferromagnets

Jürgen Schnack, Florian Johannesmann, Henrik Schlüter, Jannis Ecksele

Department of Physics – Bielefeld University – Germany

<http://obelix.physik.uni-bielefeld.de/~schnack/>

APS Global Physics Summit, MAR-L37:13
Denver, USA, 18 March 2026

Context: Thermalization

Investigation of closed quantum systems
under unitary time-evolution:

What happens?

Context: Thermalization

Investigation of closed quantum systems
under unitary time-evolution:

What happens?

Generically: relaxation, equilibration, thermalization

Context: Thermalization

Investigation of closed quantum systems
under unitary time-evolution:

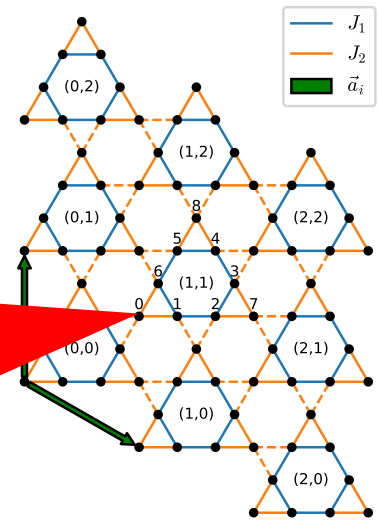
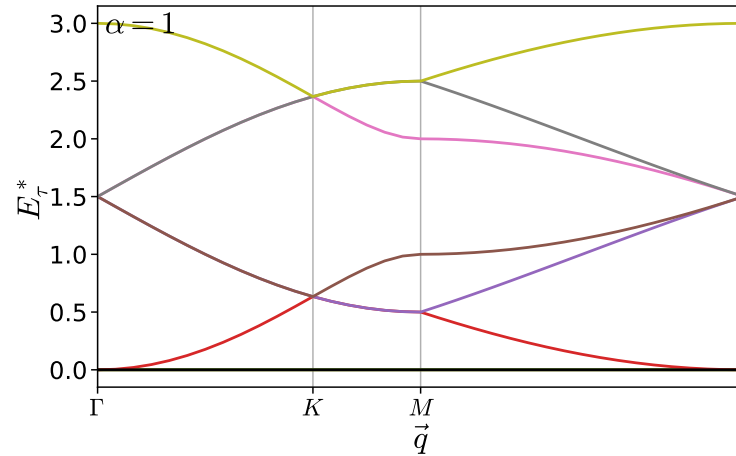
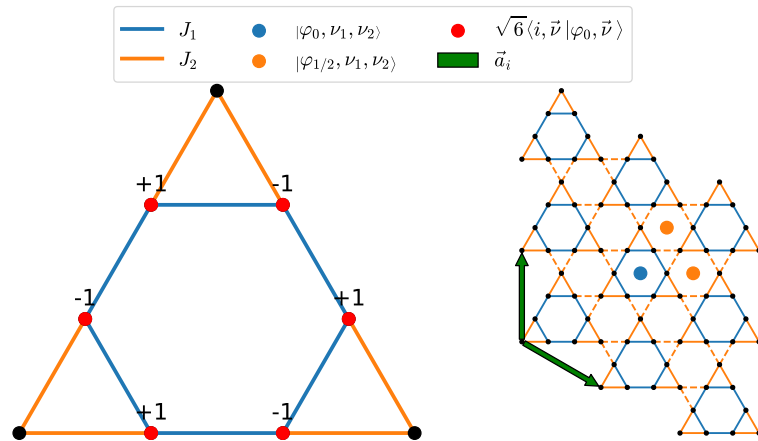
What happens?

Generically: relaxation, equilibration, thermalization

With flat bands: zero group velocity, localized eigenstates

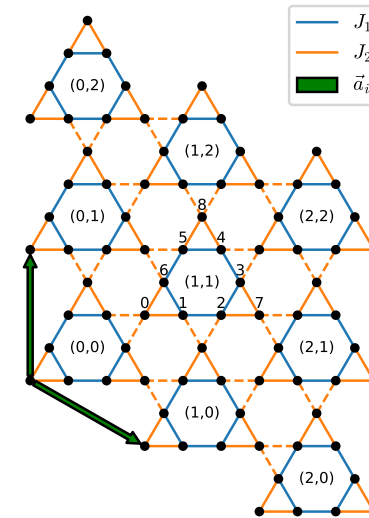
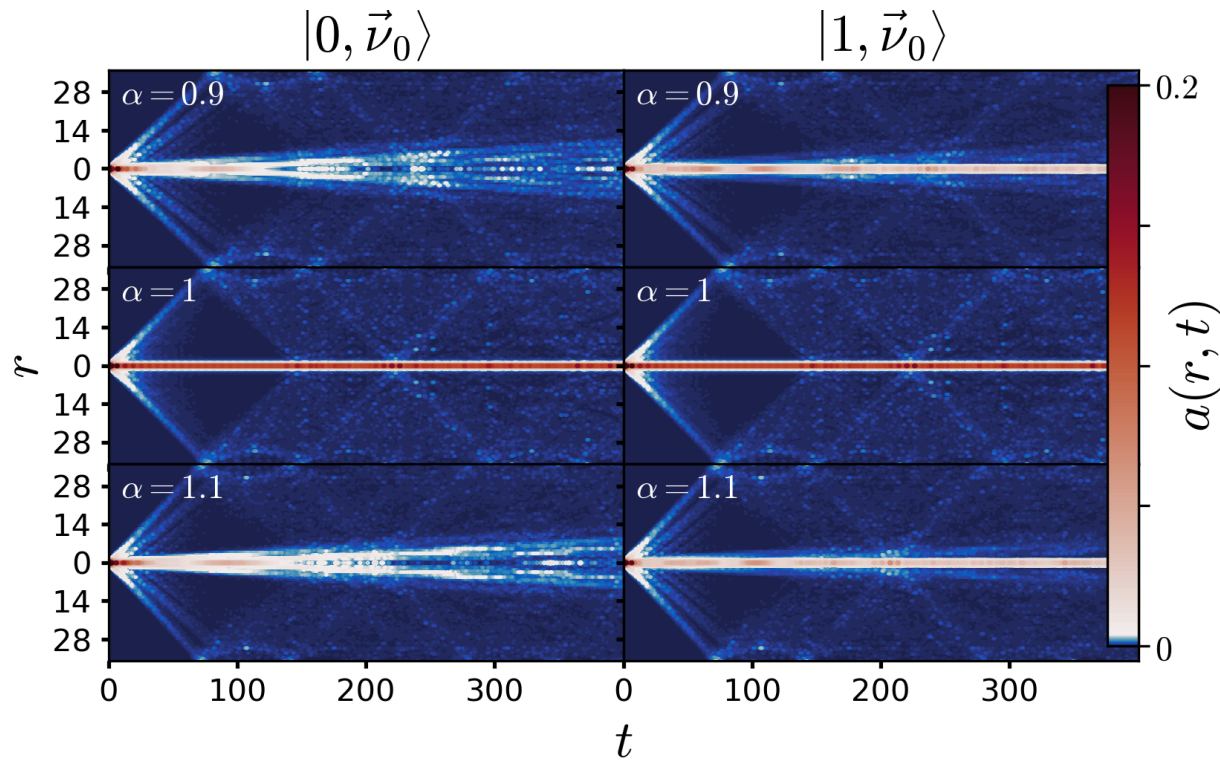
⇒ NO relaxation, equilibration, thermalization

Starring today: the antiferromagnetic kagome lattice



- Heisenberg model, $s = 1/2$, one-magnon space
- All spins up: flip a spin at site 0 or 1
- **What happens?**

H. Schlüter, J. Schnack, and J. Ecksele, Zeitschrift für Naturforschung A (2026), doi: 10.1515/zna-2025-0249.



- $\alpha = J_2/J_1$, 3 degenerate flat bands for $\alpha = 1$, one left otherwise
- **Stationary local magnetization!**

H. Schlüter, J. Schnack, and J. Ecksele, Zeitschrift für Naturforschung A (2026), doi: 10.1515/zna-2025-0249.

Summary



- Initial states that contain parts of flat bands or localized eigenstates **CANNOT** equilibrate or thermalize.
- This holds for many systems: kagome, pyrochlore, delta chain, . . . , and is not restricted to one-magnon space.

H. Schlüter, J. Schnack, and J. Eckseler, *Non-ergodic one-magnon magnetization dynamics of the Kagome lattice antiferromagnet*, *Zeitschrift für Naturforschung A* (2026), doi: 10.1515/zna-2025-0249.

F. Johannesmann, J. Eckseler, H. Schlüter, J. Schnack, *Non-ergodic one-magnon magnetization dynamics of the antiferromagnetic delta chain*, *Phys. Rev. B* 108 (2023) 064304

Thank you very much for your attention.