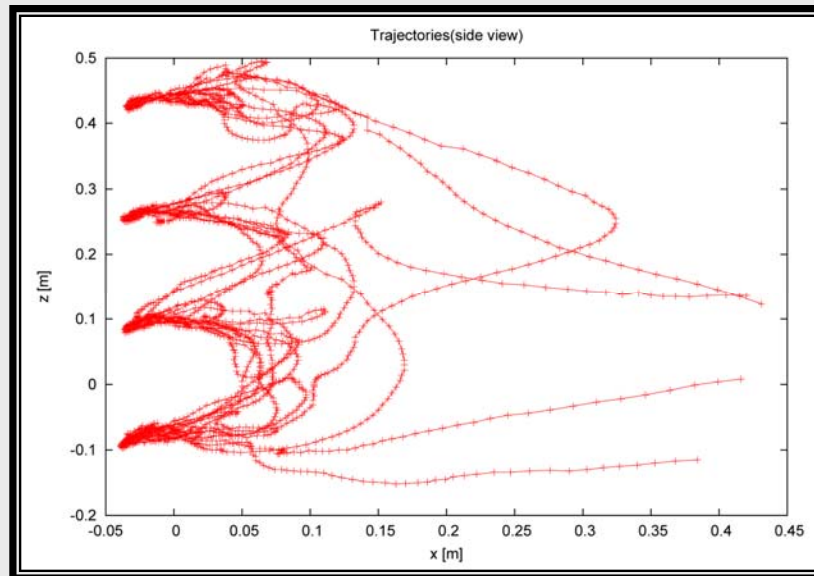


Anomalous dynamics of foraging bumblebees

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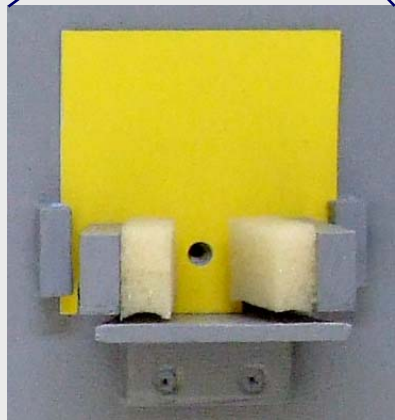
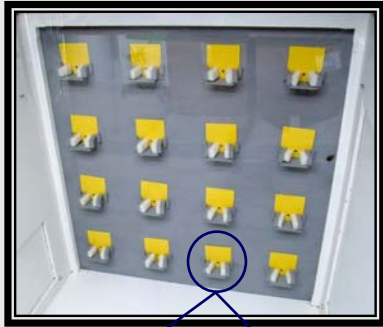
Ecology

- Find food (nectar & pollen) in complex landscapes

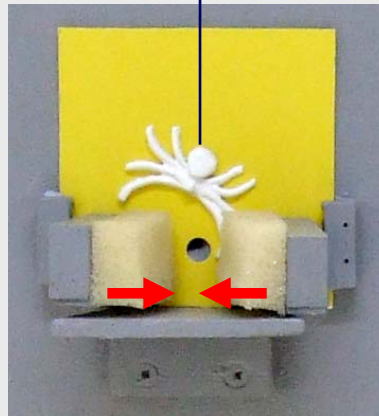


- Try to avoid predators

Behaviour - avoidance learning paradigm



“Safe” flowers
(trap inactive)



“Dangerous”
flowers
(active trap)

“Robotic” spiders



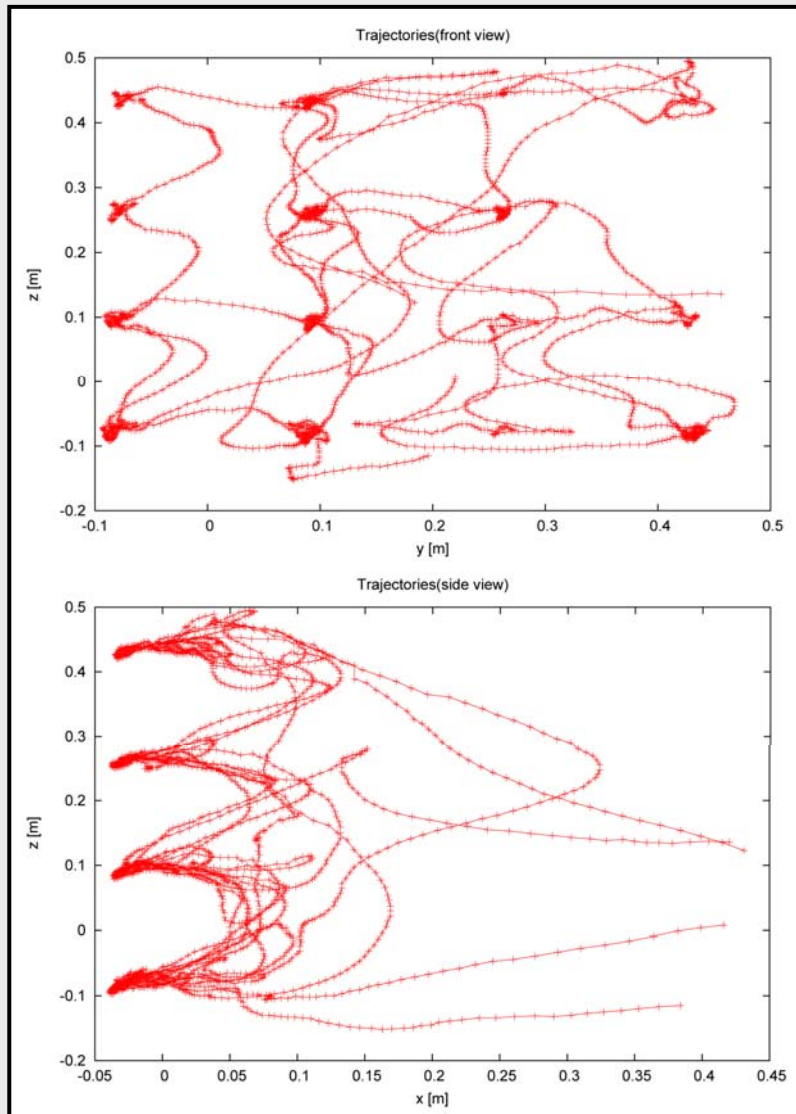
Feeding
mechanism

Remotely
controlled
solenoid

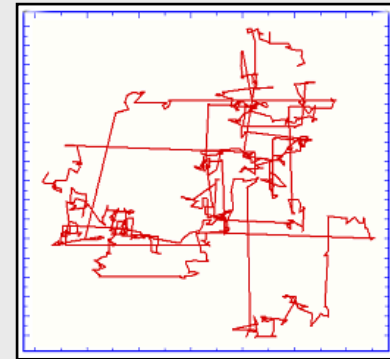
+

Trapping mechanism

Statistical physics

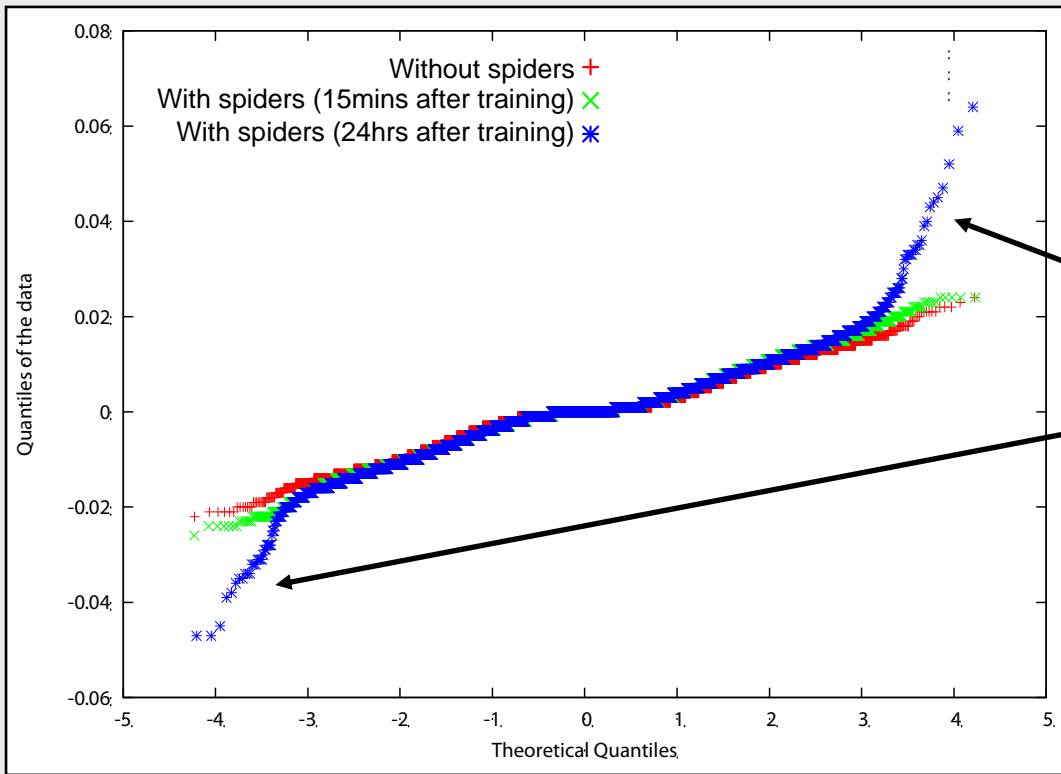


- Examine flight trajectories
- Develop new methods to detect anomalous flight behaviour (e.g. Lévy flights)



- PDFs of velocities for different environmental conditions

Key results so far

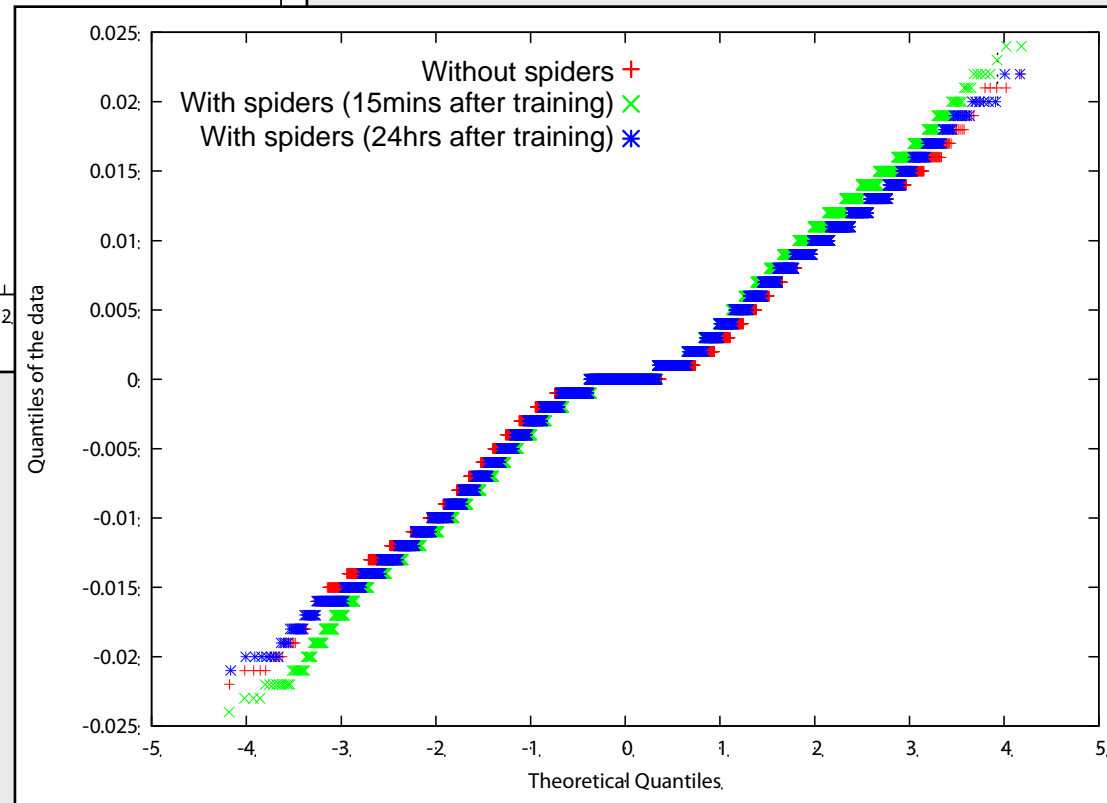
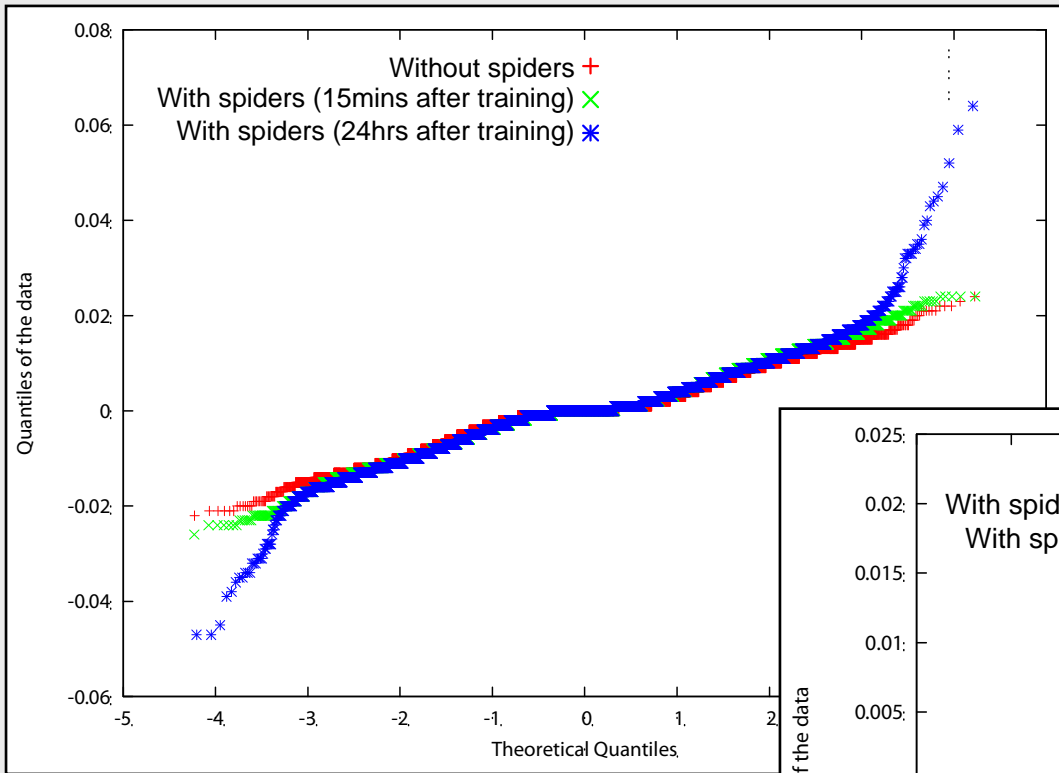


Anomalous flight behaviour?

More fast movements / high velocities than expected

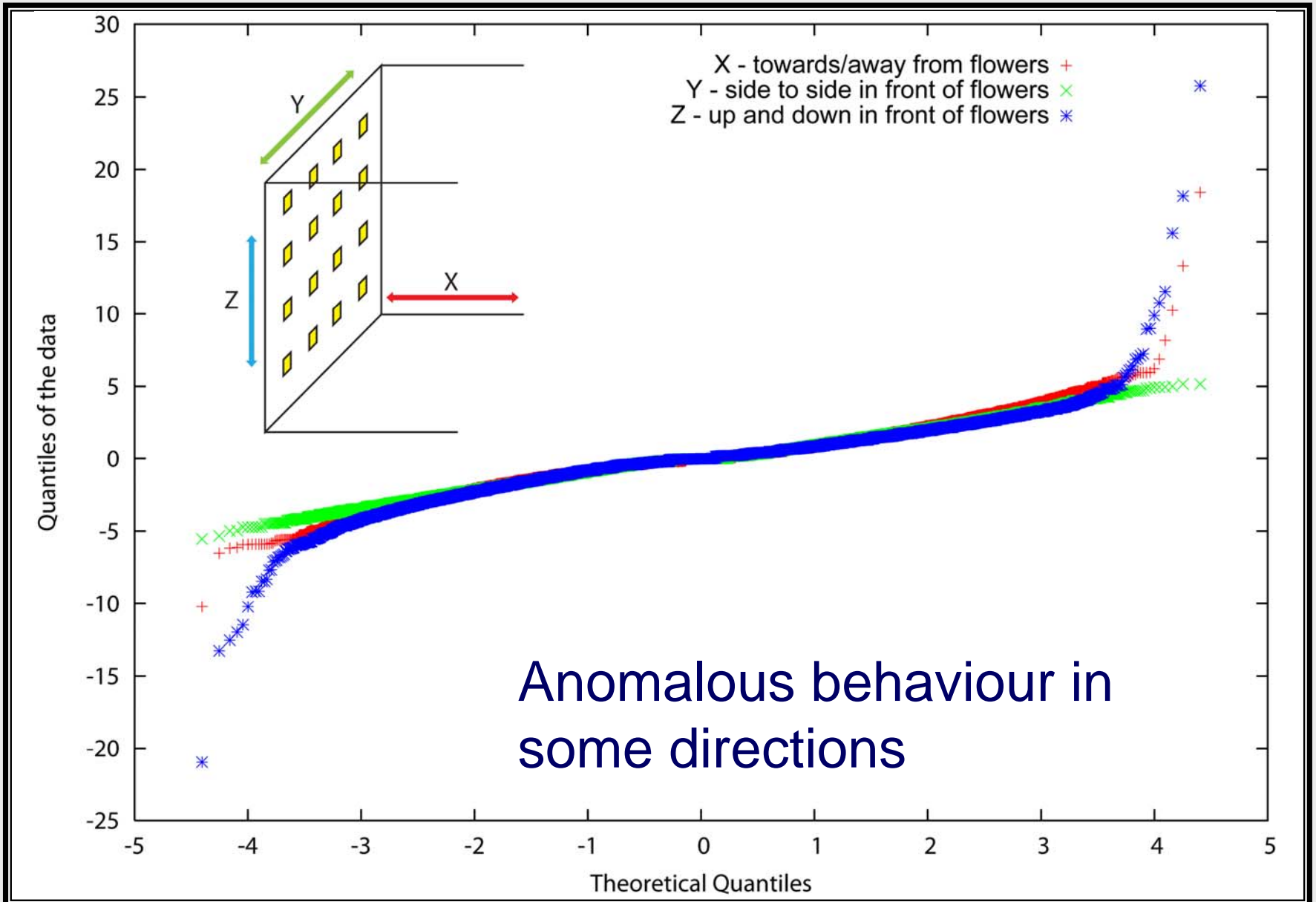
Key results so far

Differences in flight behaviour?



BUT – no differences
when outliers removed

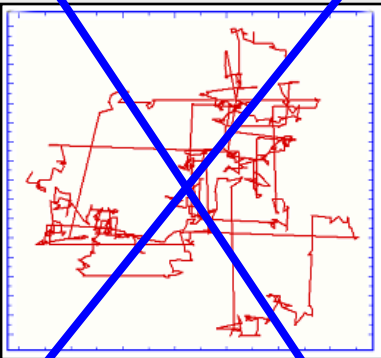
Key results so far



Summary



- Individual behaviour important
- No qualitative change in response to environmental conditions
- Anomalous behaviour in some directions
- So far, Lévy flight behaviour is not common



$$f(x; \mu, \sigma^2) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(x-\mu)^2/(2\sigma^2)}$$
$$= \frac{1}{\sigma} \phi\left(\frac{x-\mu}{\sigma}\right), x \in \mathbb{R},$$

- Need to look for quantitative differences
- Explore individual differences

Outputs & Follow-on projects

- 1 day workshop “*Understanding the dynamics of foraging bumblebees*” – 10 July 2009
 - Funded by BTG
- PhD Studentship (Friedrich Lenz)
 - Funded by Queen Mary College Doctoral Training Account
- Workshop on “animal foraging” 2010
 - Joint funding by London Dynamical Systems Group & BTG
- Planning to publish results soon