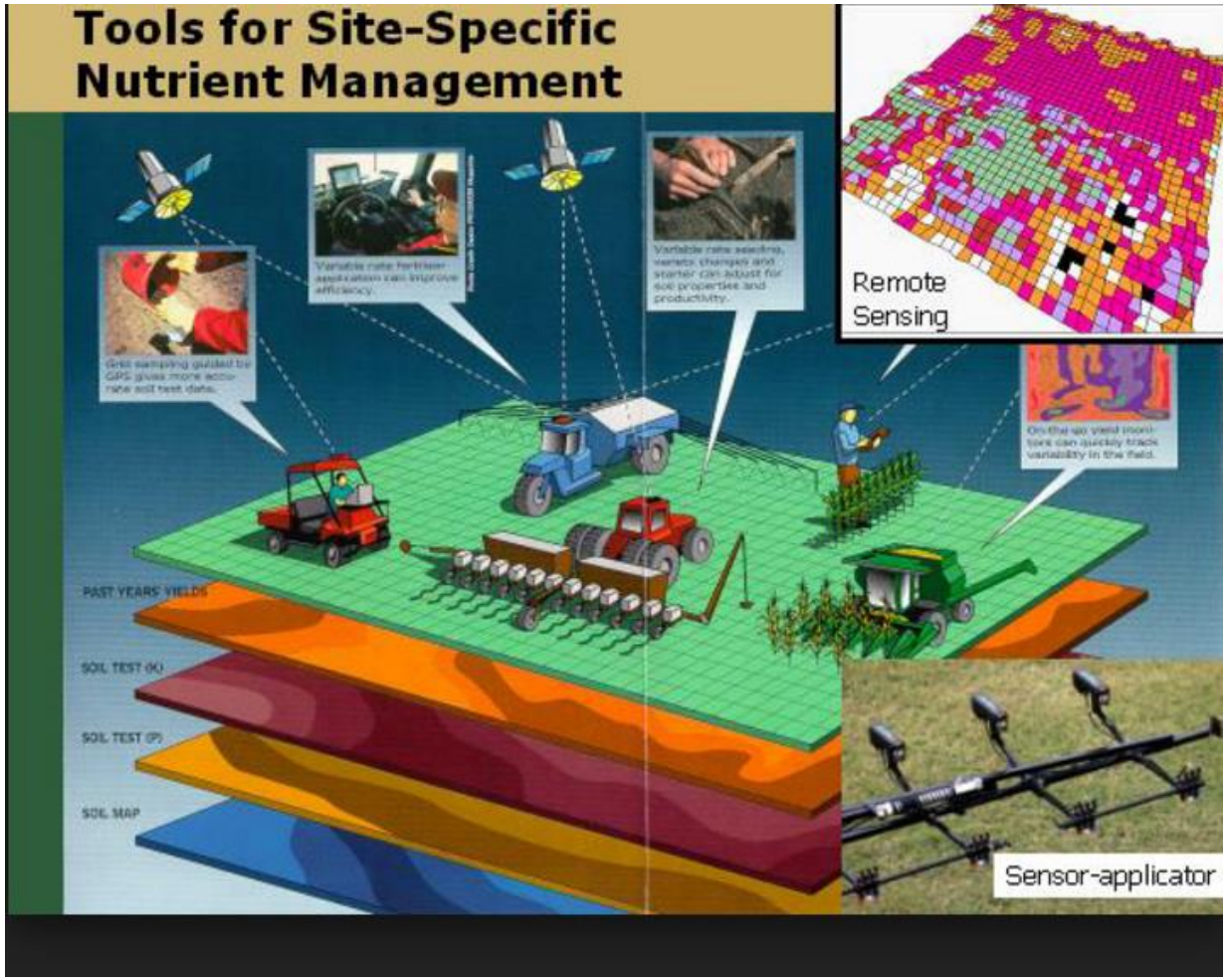
Remote sensing, research and applied problem solving

Christian Nansen (UC Davis) – chrnansen@ucdavis.edu



Unique responses by species to spatial heterogeneity

ASSESSING AND INTERPRETING THE SPATIAL DISTRIBUTIONS OF INSECT POPULATIONS

L. R. Taylor

The Insect Survey, Rothamsted Experimental Station, Harpenden, Hertfordshire, England, AL5 2JQ

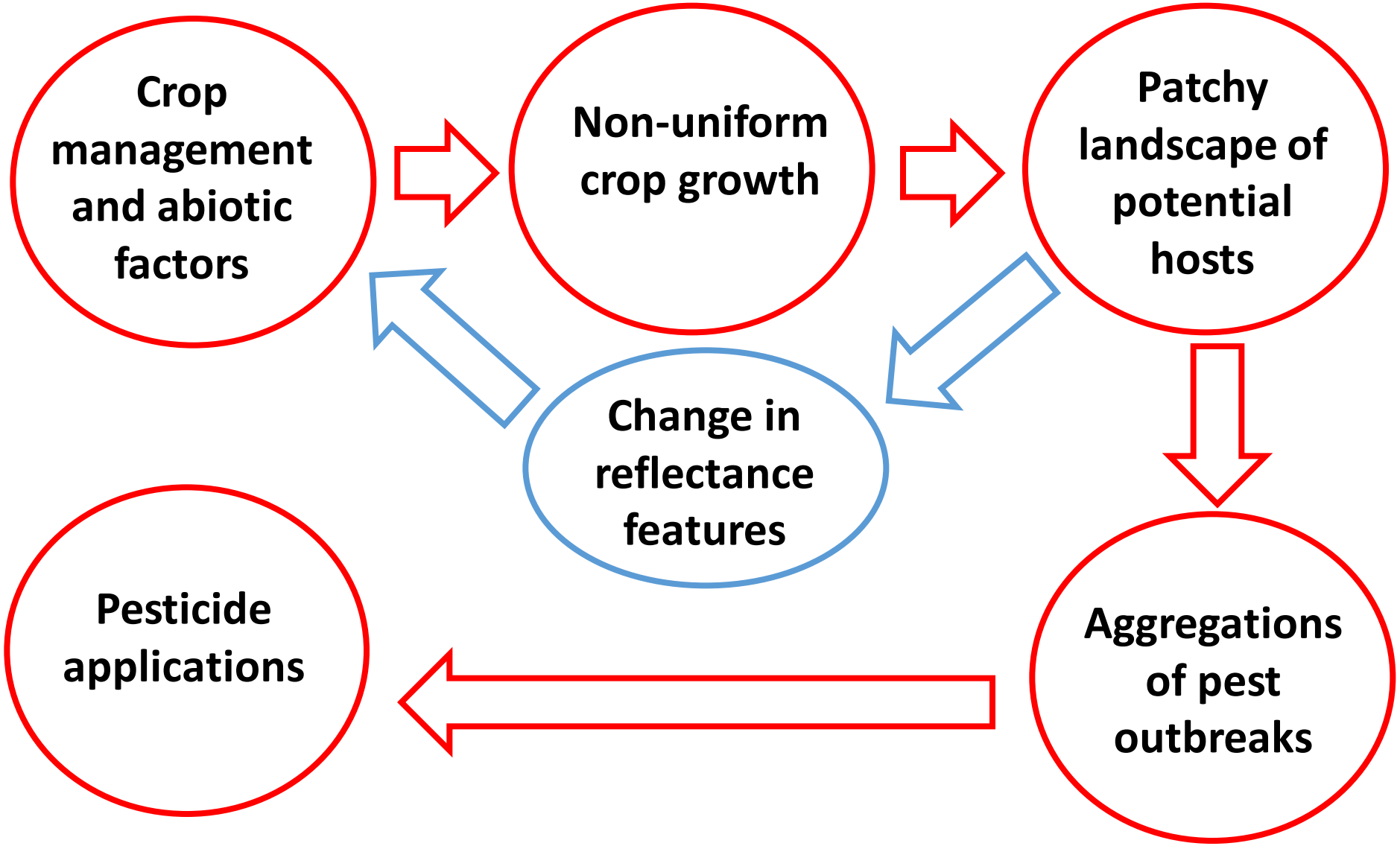
INTRODUCTION

Spatial distribution is one of the most characteristic ecological properties of species. Unlike rates of growth and reproduction, which often vary more between generations within a species than they do between species, spatial distribution yields characteristic parameters that segregate species. These parameters are the population expression of the individual behavior defined by the ethologist and observed by the naturalist. They determine the spatial distribution of temporal dynamic change. Starlings flock, herrings school, and deer

Ann. Rev. Entomol. 1984. 29:321–57

Remote sensing and intelligent risk detection of diseases and pests

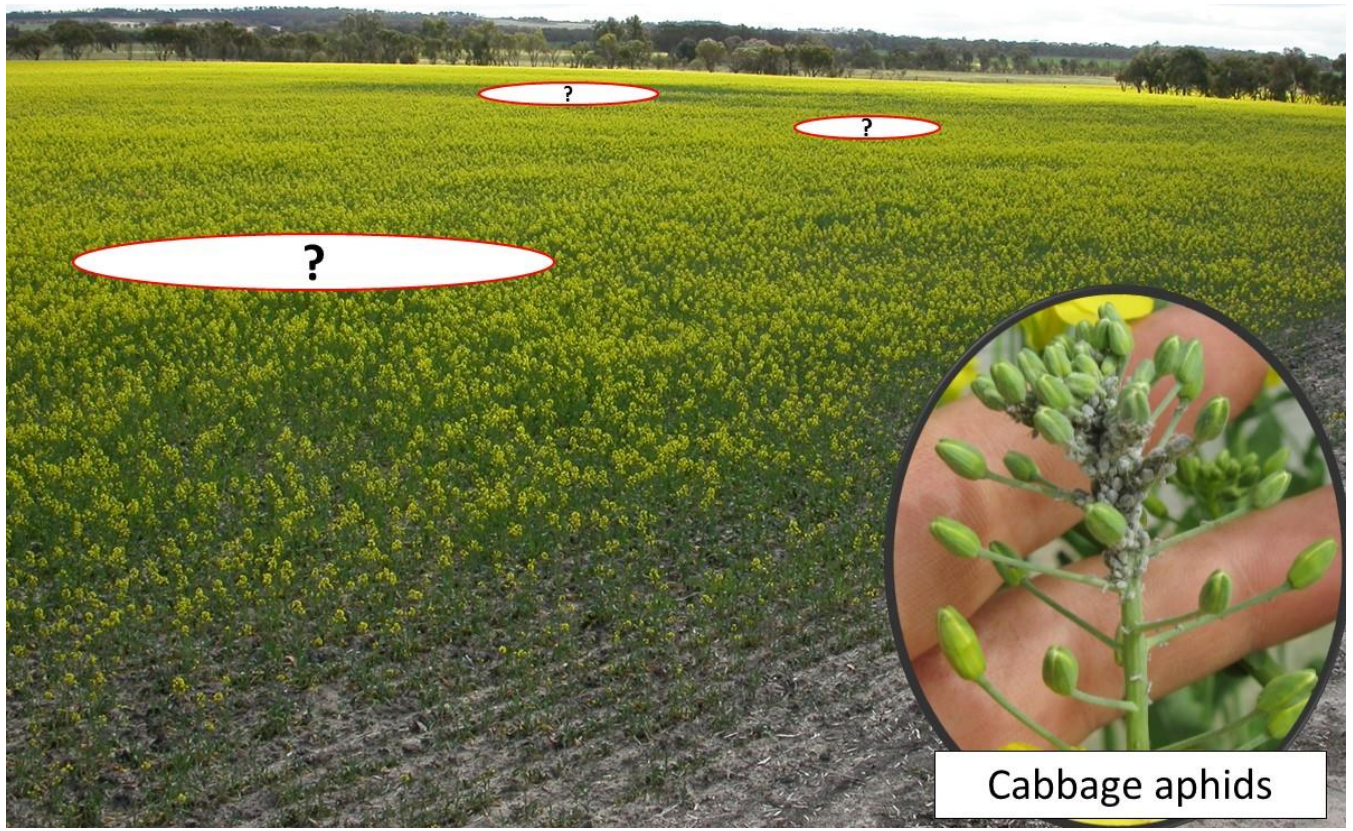
The working hypothesis

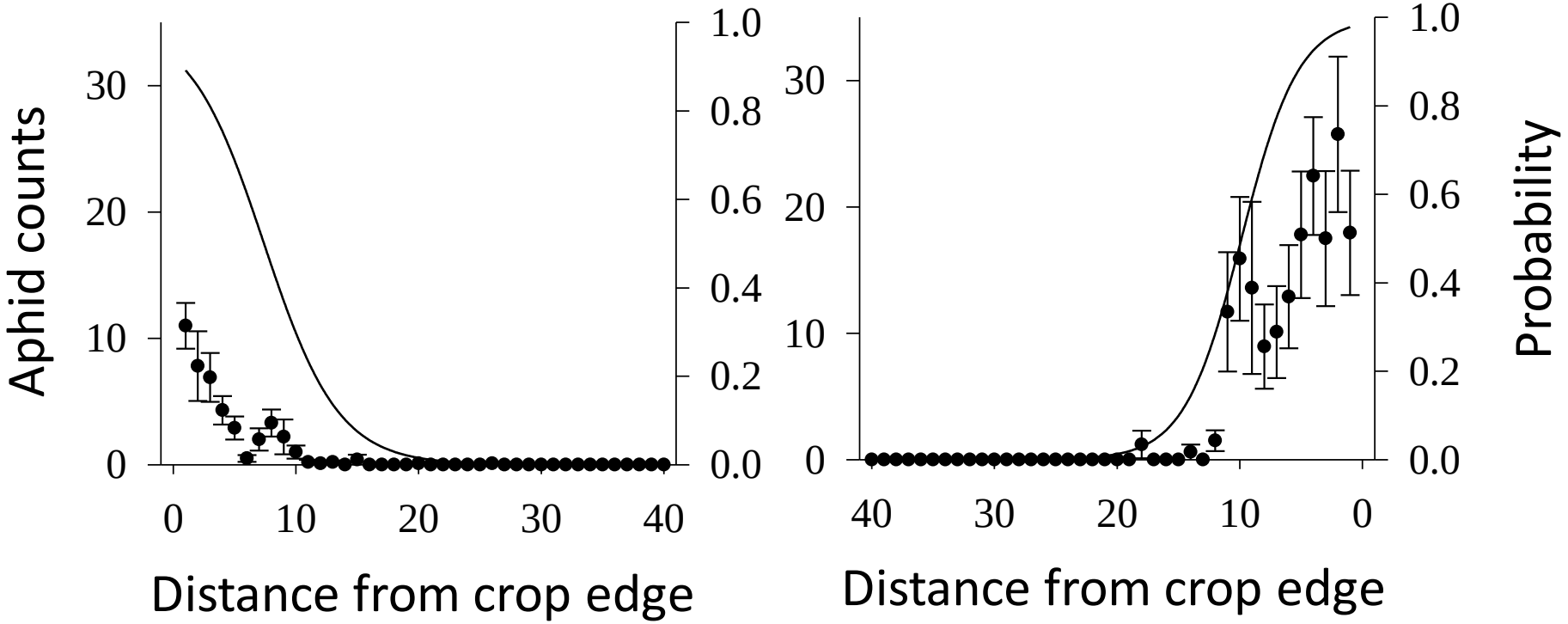


Nonrandom Distribution of Cabbage Aphids (Hemiptera: Aphididae) in Dryland Canola (Brassicales: Brassicaceae)

DUSTIN SEVERTSON,[1,2,3] KEN FLOWER,[4] AND CHRISTIAN NANSEN[1,5]

Environ. Entomol. 1–13 (2015); DOI: 10.1093/ee/nvv021




Aphid counts
30
20
10
0
1.0
0.8
0.6
0.4
0.2
0.0
0
10
20
30
40
Distance from crop edge
Probability
40
30
20
10
0
Distance from crop edge

Remote sensing and the applied research questions to address

How early can it be detected?

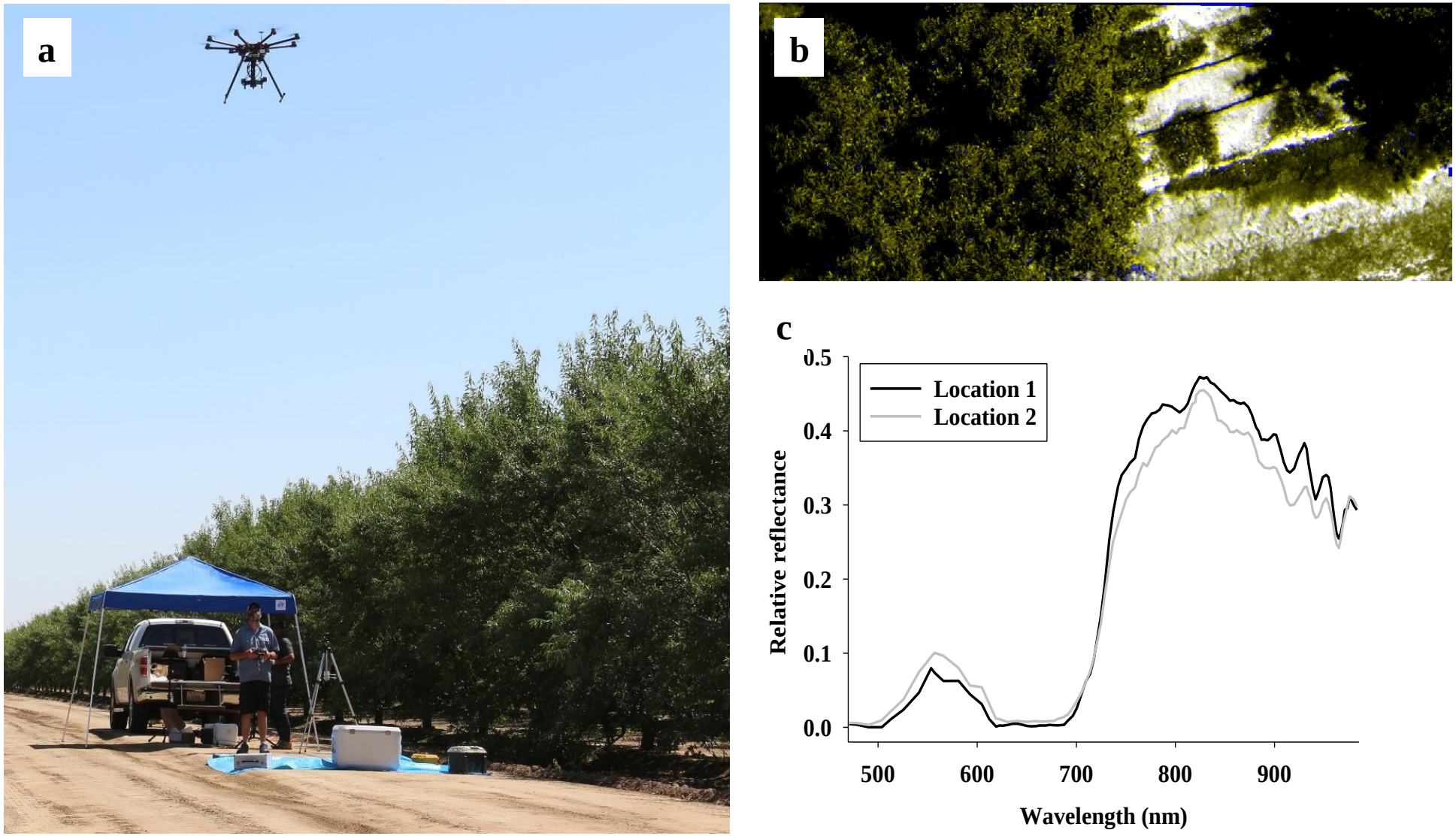
How consistent is it (spatio-temporally)?

How distinct is it from change caused by other stressors?

To what extent is it detectable if multiple stressors interact?

To what extent are changes in reflectance associated with physiological changes in crop plants?

Fig. 3. Airborne remote sensing



Remote sensing - basic research questions challenges

- Acquisition of input data
- Robustness (repeatability) of input data
  - Calibration of input data
  - Processing of input data
  - Filtering of input data
- Classification of input data

Fundamental understanding of the relationships between reflectance and crop physiology and genetic make-up

Plant medicine and remote sensing

"Preventive medicine" and agriculture

- Growth promoters
- Molecular technologies
- Symbiotic rhizobacteria
- Smart-use of fertilizers

Host selection ecology

- Preference studies
- Pest development studies
- Food web communities

Feeding and establishment by pests is non-random.

Remote sensing is a valuable tool to study spatial and temporal patterns of feeding and establishment by pests.

Characterization of feeding patterns, pest establishment, and food webs will lead to novel and more sustainable management options.

Thank you

Christian Nansen (chrnansen@ucdavis.edu)