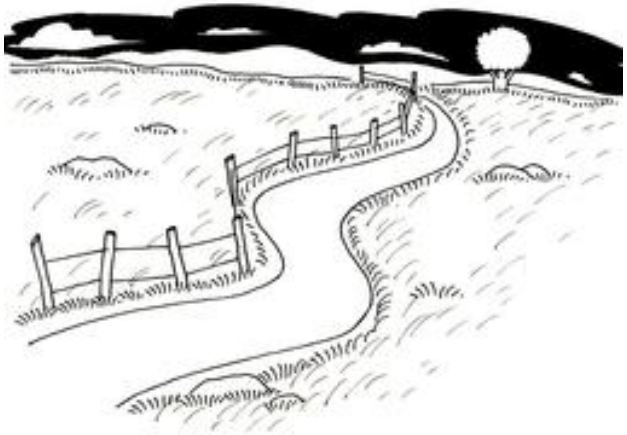
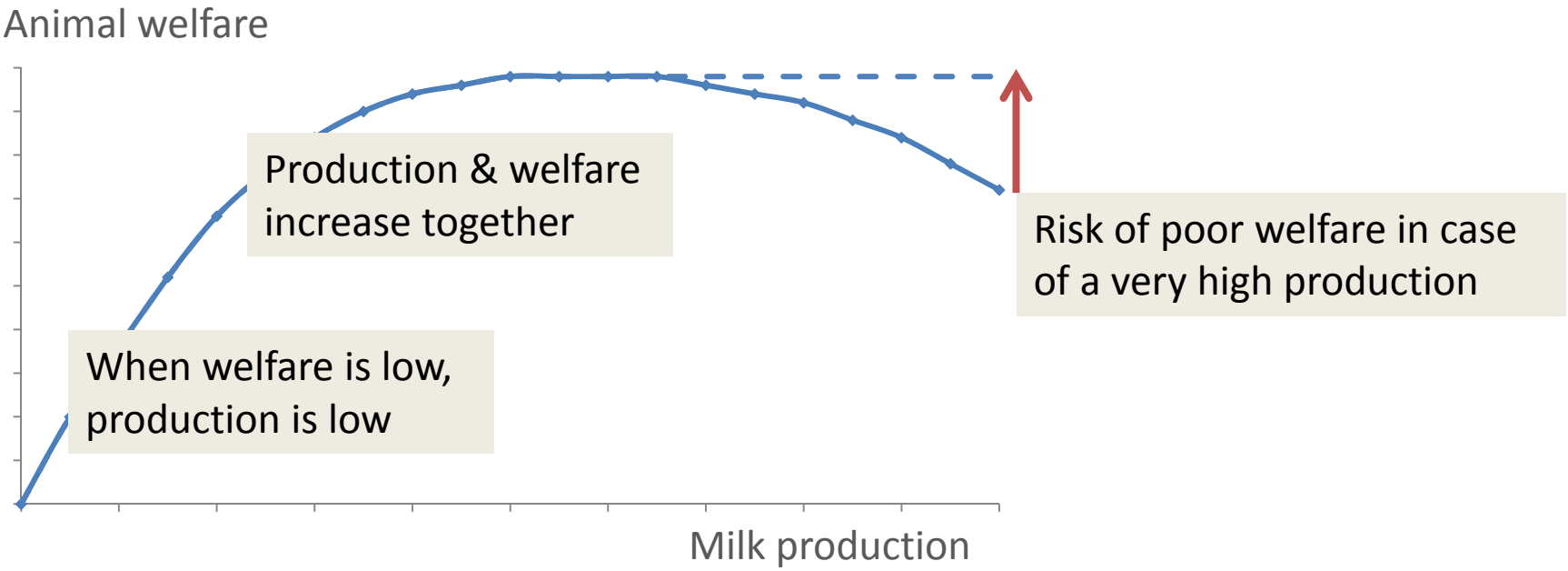
« Dairy cows are like F1. They are fragile.
If you drive a F1 on a ground path, it will break »

Didier, a farmer from Jura, France



Can PLF help reduce the mismatch and maintain a good welfare?



Increasing the value of existing PLF systems to assure dairy cows' welfare

Cow Group
KUL (C Bahr then T Norton, A Pena Fernandez) *BE*
GEA (S Klimpel, KH Sloth, C Pathak) *DE-DK*
INRA (B Meunier, MM Mialon, M Silberberg, I Veissier) *FR*
ARO (I Halachmi) *IL*, **SLU** (P Nielsen, H Blokhuis) ,**Teagasc** (B Earley) *IR*

EU-PLF Closing conference

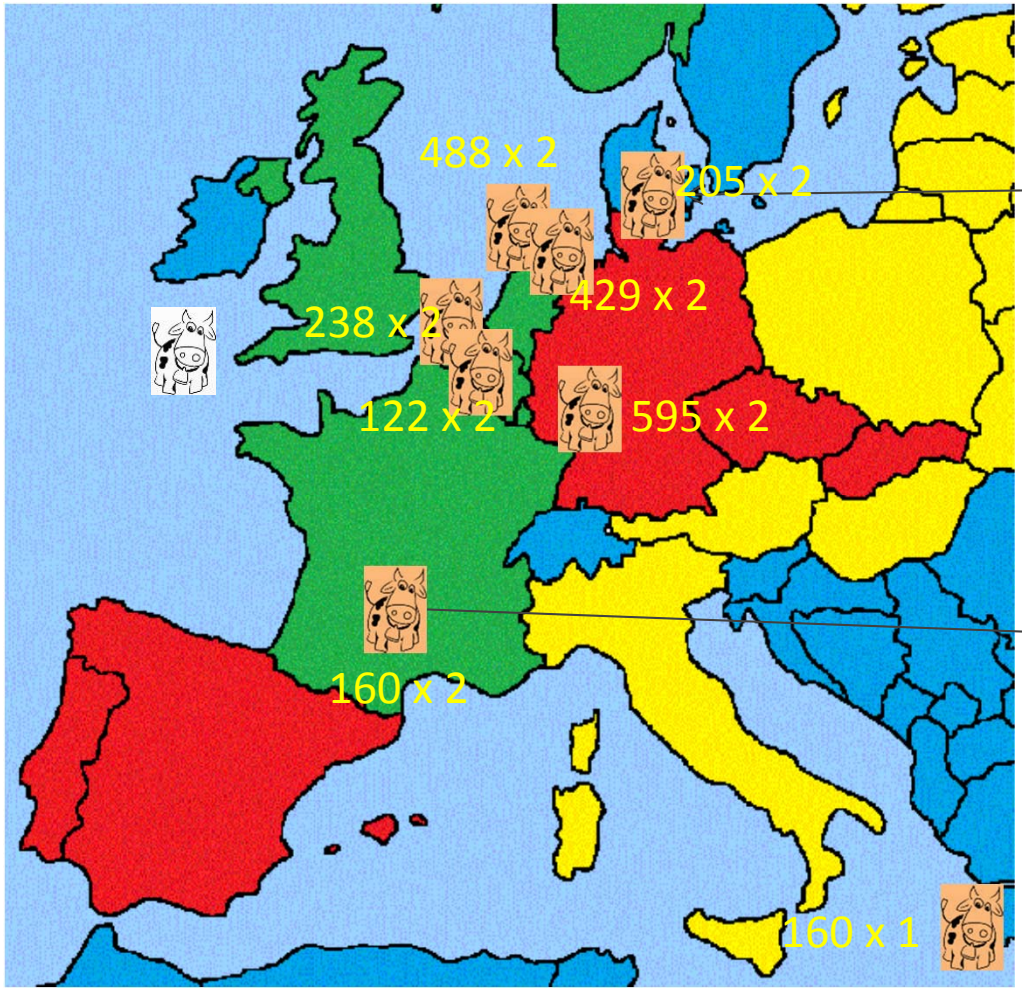
29 September 2016, Brussels, Belgium

Dairy farms monitored in EU-PLF

8 farms
CowView :
RTLS ➔
Position

SoundTalks:
sound

No. cows x cycles
(total 1300 cows)



+ *CowScout*
& *IceTag*:
lying, standing

+ Feed intake
Weight
Milk composition
Ruminal pH *eCow*

+ Feed intake
Milk composition
Weight

Aim: Getting further with existing sensors and systems

Information from sensors
- Behaviour
- Sound
- Ruminal pH
- …

→ Validation Analysis Modelling

→ Specific information for health, housing, and nutrition management

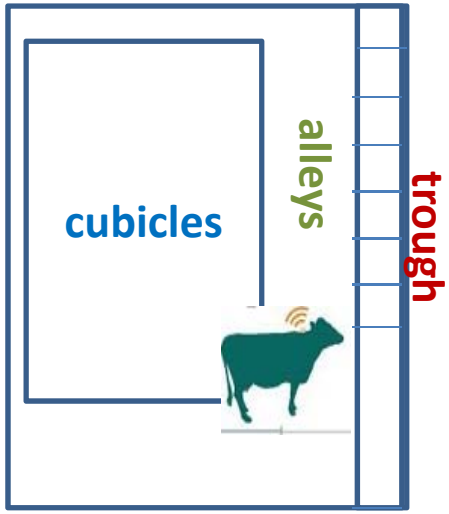
Individual approach: each cow is monitored

PLF and health management

Use of a RTLS to analyse cow activities

Antennas

tag



CowView

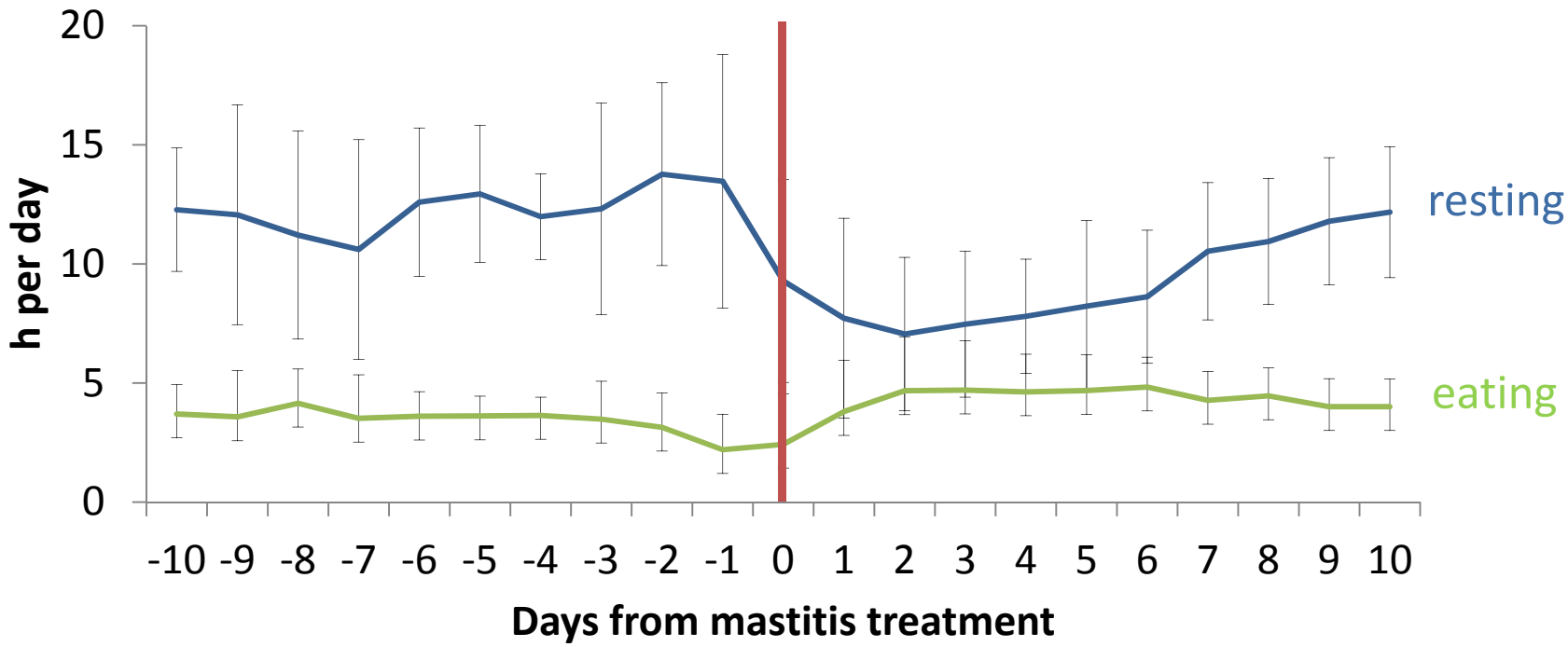
Description of the normal time budget of each cow
Cow more active (e.g. walking) than normal ➔ alarm: oestrus?
Cow less active (e.g. resting) than normal ➔ alarm: disease?

i2

Diapositiva 7

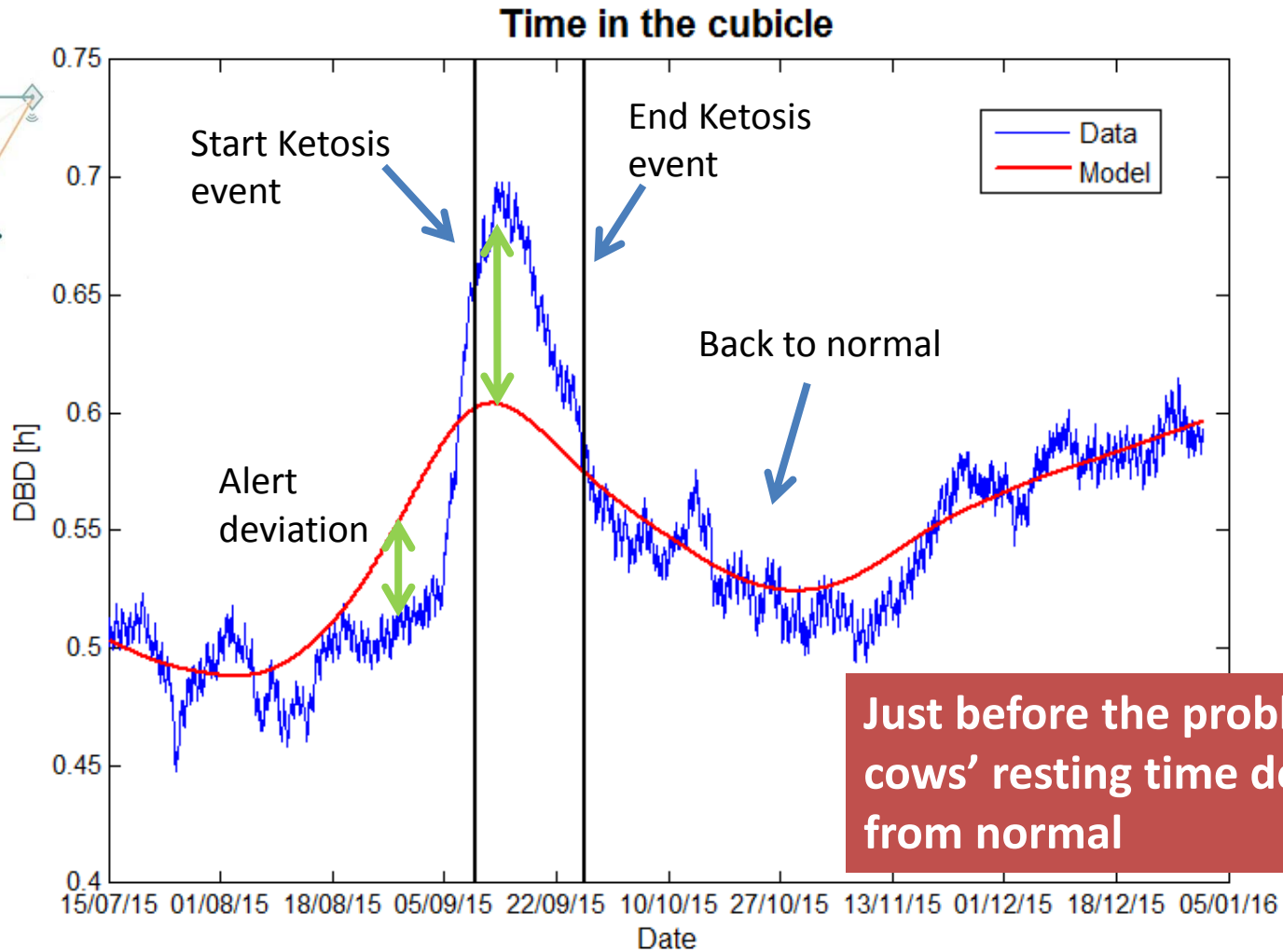
i2 iveissier; 12/08/2015

Descriptive approach based on single basic activities



Cows spend less time resting and eating at the onset of mastitis. However, due to large variations the difference is not significant.

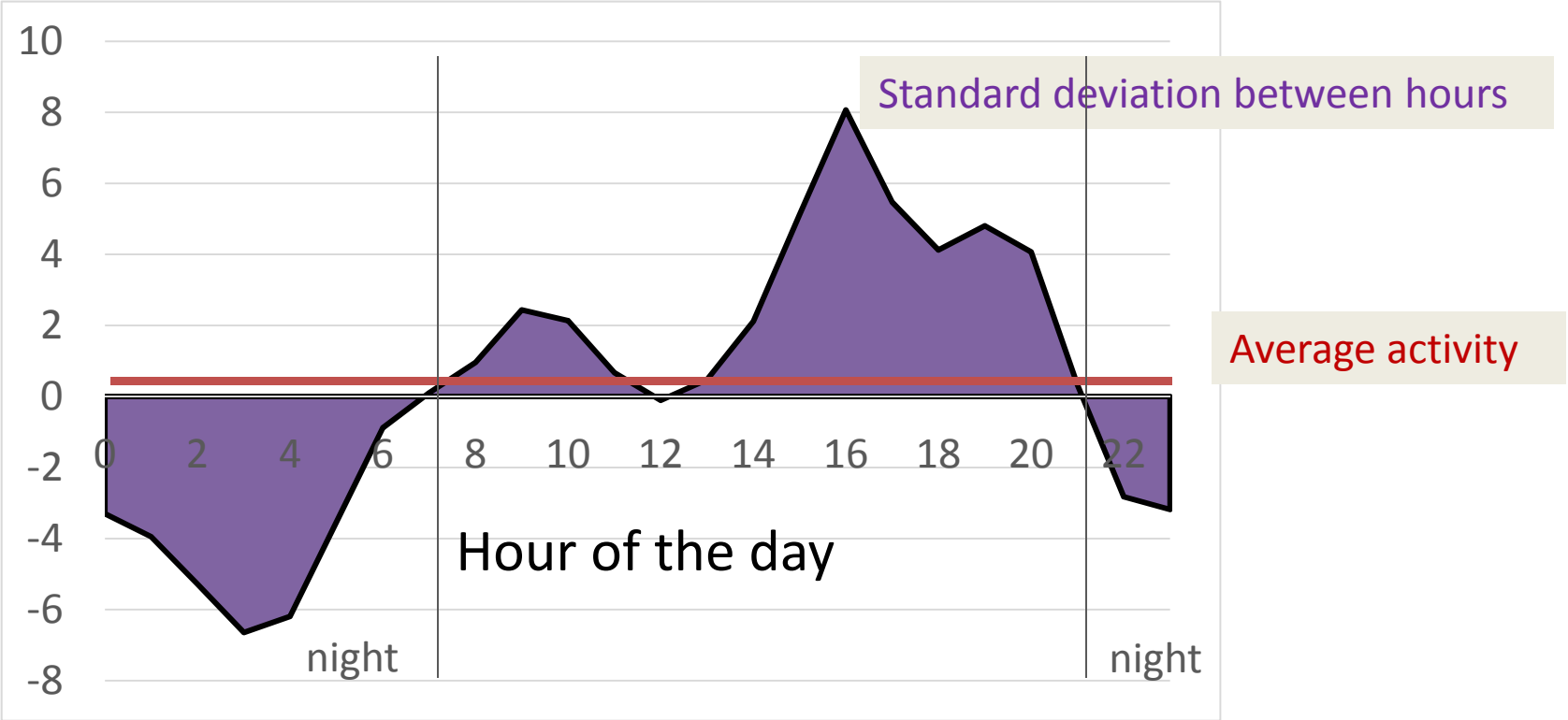
Modelling approach based on single activities



Just before the problem , cows' resting time deviates from normal

Additional information extracted from RTLS

Activity level = -.15 resting +.12 in alleys + .34 eating



Descriptive approach based on average activity & circadian variations

Data from a commercial farm: 350 cows for 5 mo

Normal day

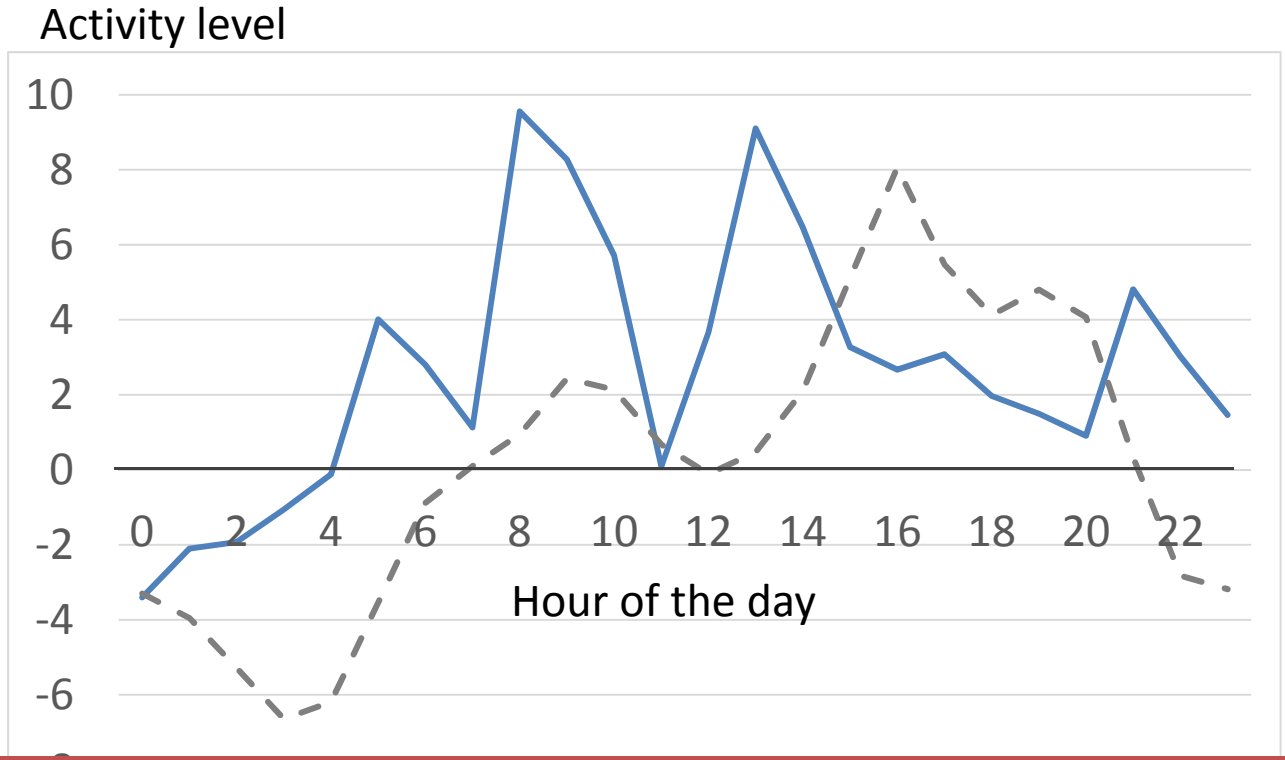
vs.

Mastitis

Average activity ↗

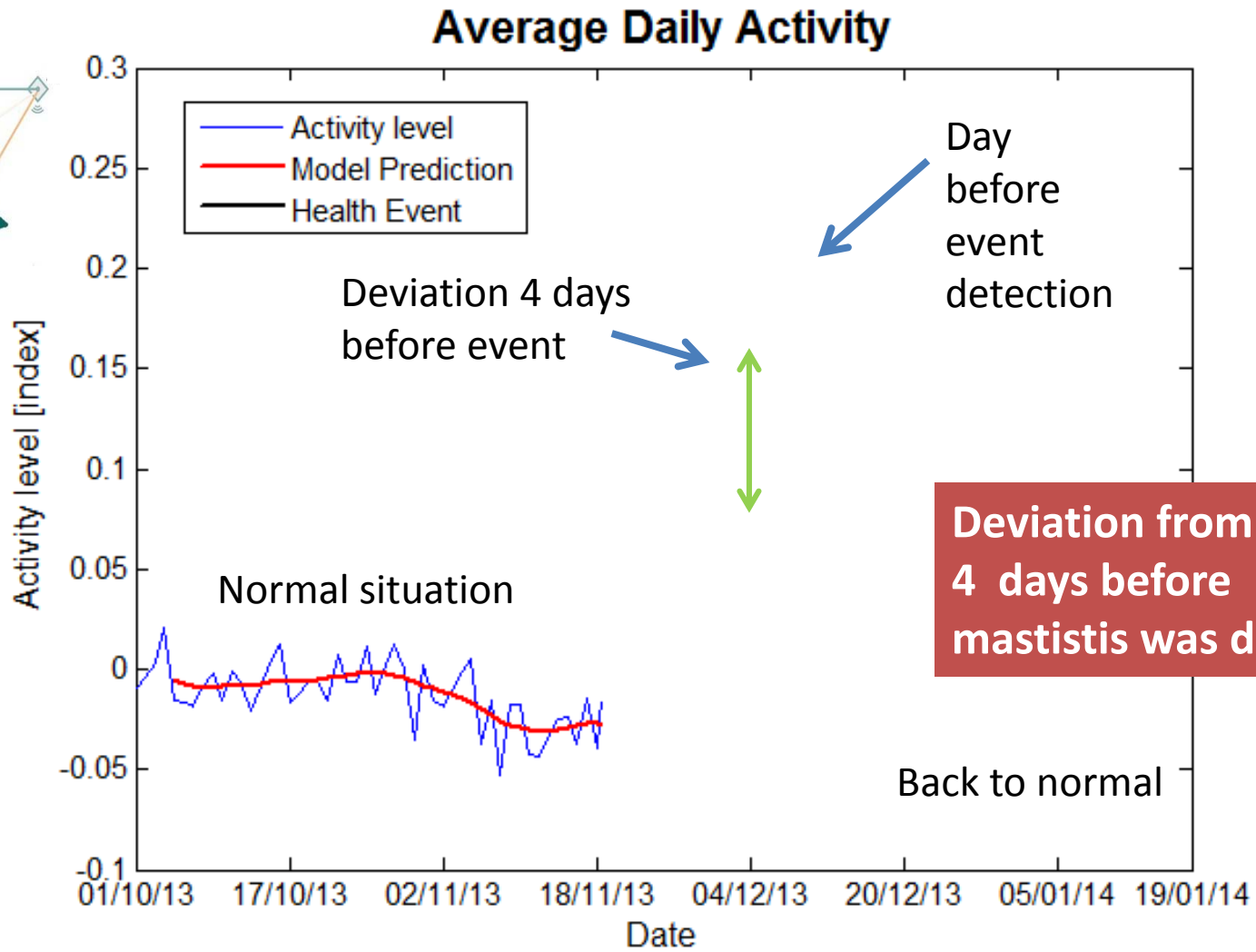
Circadian variations ↘

P < .001 (1-2 d before)



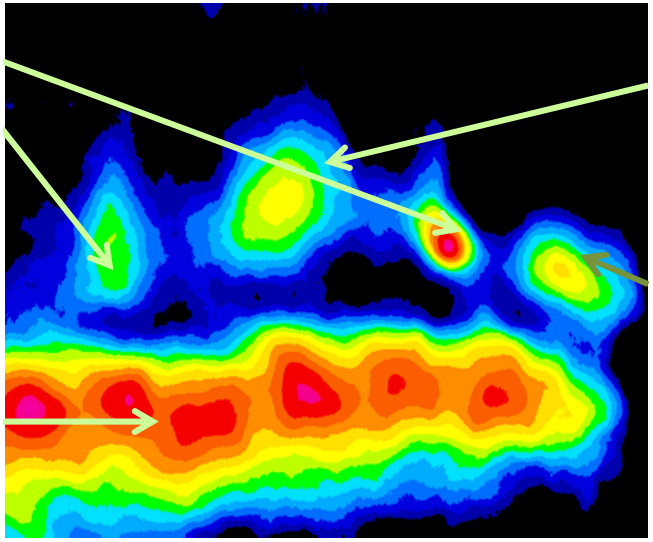
When the cow overall activity and its circadian variations are taken into account, one can predict the onset of a problem 1-2 days in advance.

Modelling approach based on overall activity

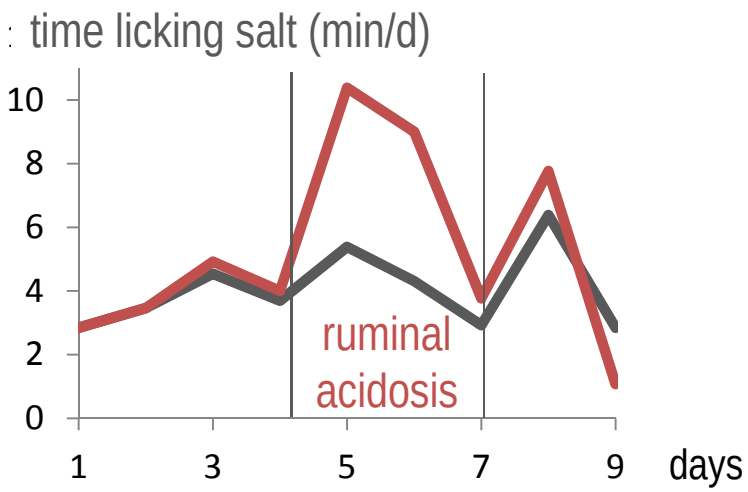


Deviation from normal 4 days before mastistis was detected!

Detection of new points of interest with RTLS and image analyses



pH bolus

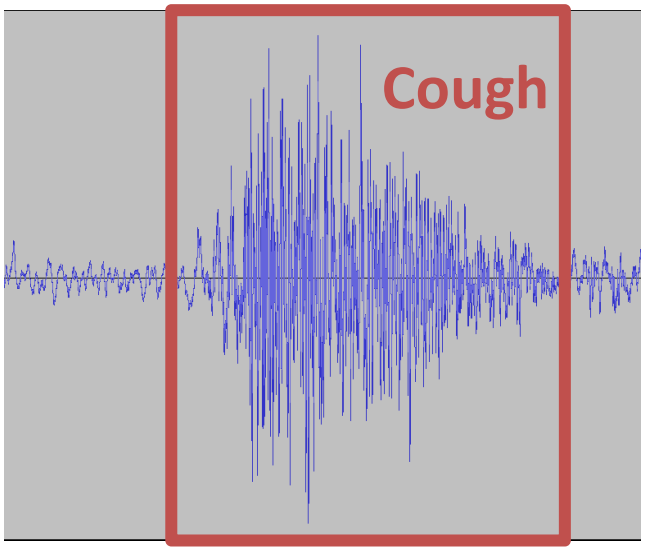


Reduced time spent licking salt could be used as an alarm.

Detection of cough in calves

SoundTalks

sound



Increased coughing frequency → early detection of respiratory diseases.

5 freedoms

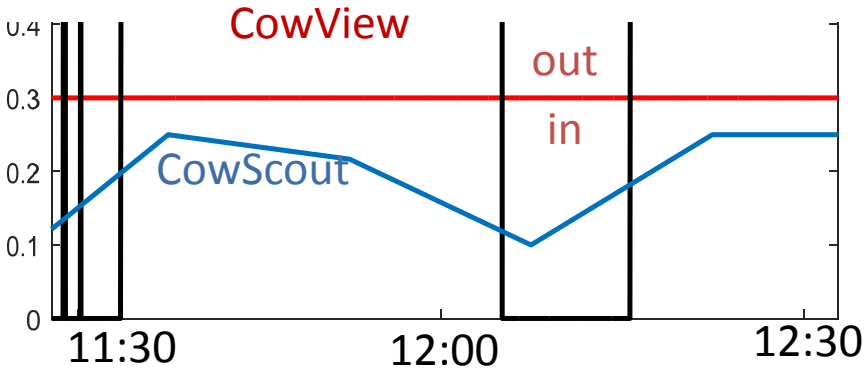
Animal welfare

1. **Freedom from hunger or thirst** by ready access to fresh water and a diet to maintain full health and vigour
2. **Freedom from discomfort** by providing an appropriate environment including shelter and a comfortable resting area
3. **Freedom from pain, injury or disease** by prevention or rapid diagnosis and treatment
4. **Freedom to express normal behaviour** by providing sufficient space, proper facilities and company of the animal's own kind
5. **Freedom from fear and distress** by ensuring conditions and treatment which avoid mental suffering

Comfort around resting

Investigation of resting behaviour

Poor design of cubicles
➔ difficulties in
lying down / getting up



Combining CowScout and CowView allows to know when the cow is lying in a cubicle and the time she takes before she completely lies down.

5 freedoms

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Use of PFL to manage feeding

Prediction of cow individual feed intake

Model

Dry Matter Intake = β0 + β1 cow location*

+ β2 production indicators (milk: kg, fat, protein)

+ β3 physiology status (weight…)

+ β4 activity measures*…

in real time

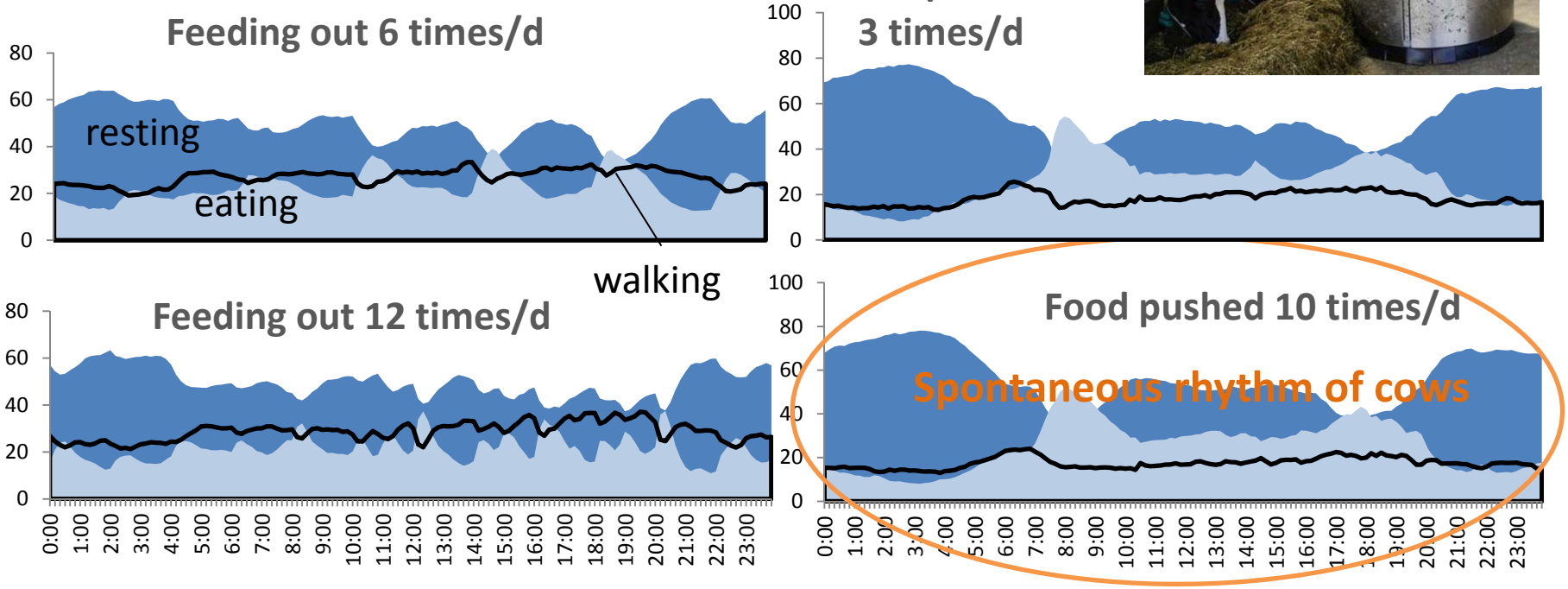
% explained by the model (R^2)	
Without PLF	74 %
With PLF*	93 %

PLF can help to adjust precisely the diet of cows.

Impacts of changes in meal distribution

Farm 1

Farm 2



PLF can be used to check the impacts of feeding strategies.

5 freedoms

Animal welfare

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Take Away messages

- **Simple signals can be used to provide very useful information** when they are processed adequately
- **Collaboration between engineers-natural scientists** and between industry – academics are essential to gain the most from PLF techniques
- In cattle, PLF can be applied at individual level allowing a **fine tune of the management of each cow** and contributing to maintain their welfare

- Modelling of **activity rhythm** during the day to detect anomalies, relate them to cow status (oestrus, mastitis, lameness, ruminal acidosis, stress…)
- Relation between a cow behaviour and its milk yield as an indicator of its **longevity**
- **Comfort activities** (e.g. use of brushes) and disease / stress
- N**etworks between animals** to study the spread of diseases
- Use of RTLS to measure **social behaviour** and **responses to humans** ➔ we could address Freedoms 4 & 5

…

… We are open to sponsors!


Thank you to care for us
and thank you for your attention

Acknowledgments and Disclaimer

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