

Precision Livestock Farming in farmers practice

Precision livestock farming for dairy cows in a Protected Designation of Origin (PDO) system: a case study-application

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Introduction

CREA and PLF: from automatic milking to heat stress monitoring

Main tools for dairy cattle PLF

Heat stress and PLF in dairy cattle – Aim

Material and Methods

Location and animals: barn and management - Tools: the meteorological station

Tools: the TMR on-line analysis system (Dinamica Generale + Sgariboldi)

Tools: the SCR-SIVAM system

The conceptual framework

Location and animals: the data set - Statistical analysis

Results and Discussion

Climate data

Rumination and production data

Conclusion - Acknowledgments

CREA and PLF: from automatic milking to heat stress monitoring

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Welfare Assessment Based on Metabolic and Endocrine Aspects in Primiparous Cows Milked in a Parlor or with an Automatic Milking System*

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Milk Quality and Automatic Milking: Fat Globule Size, Natural Creaming, and Lipolysis*

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Effect of Automatic Milking Systems on Milk Yield in a Hot Environment

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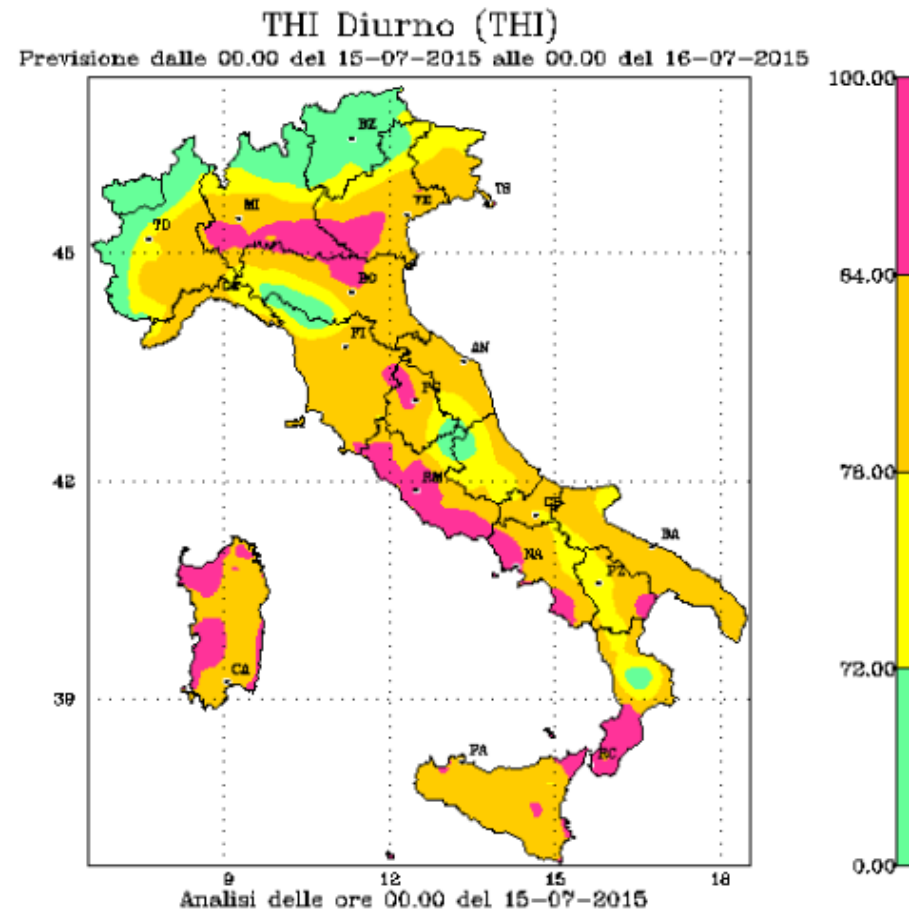
Evaluation of Milk Enzymes and Electrolytes, Plasma Metabolites, and Oxidative Status in Twin Cows Milked in an Automatic Milking System or Twice Daily in a Conventional Milking Parlor

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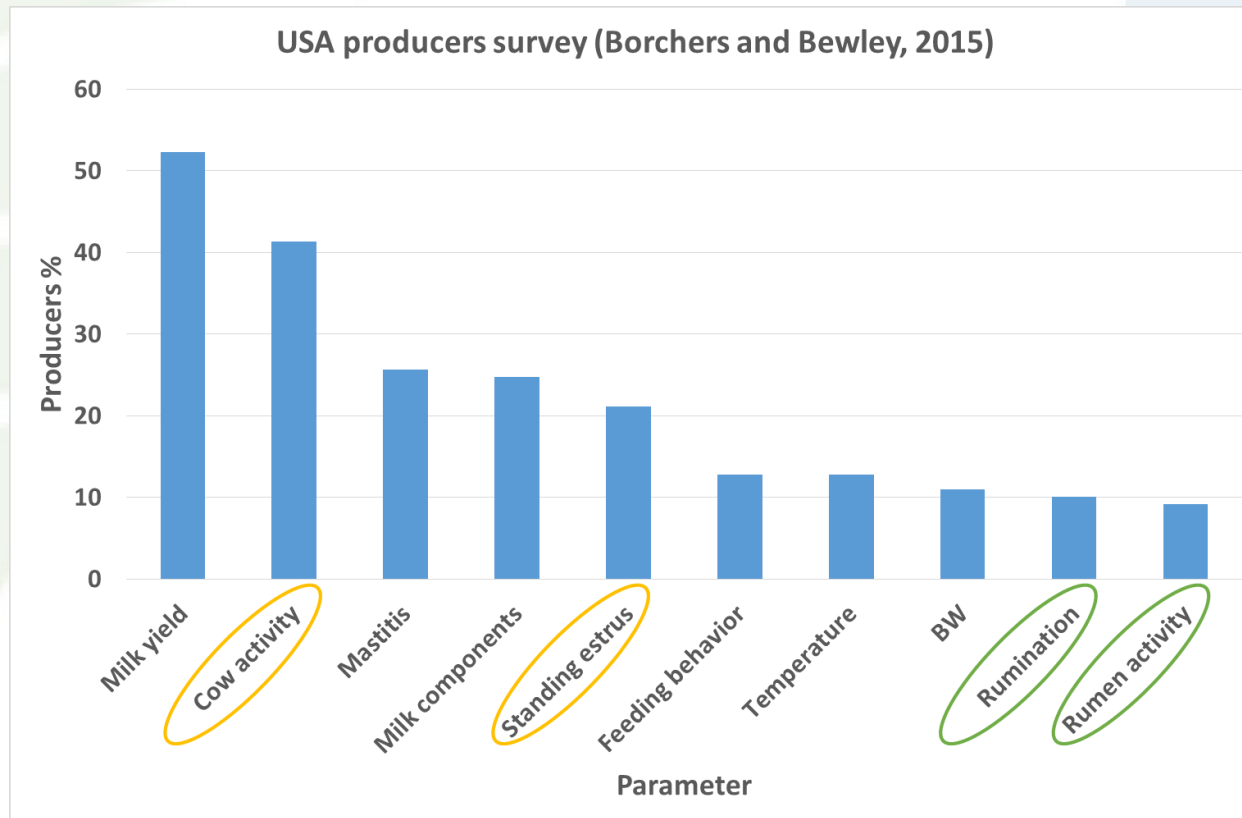
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Main tools for dairy cattle PLF (Hady et al., 1994; Borchers and Bewley, 2015; Titler et al., 2015)

Days to first service: **80 → 60 d** + Efficiency of detected estrus: **50 → 60 %**
(detecting estrus is the major limitation to achieving a pregnancy) + Conception rates: **35 → 50%** = In a 300-cow dairy herd → **increased net income \$ 18,485**



Aim

To report a case-study on the application of PLF to manage heat stress related problem in PDO dairy farming

Location and animals: barn and management

Herd: 58 lactating dairy cows

«Baroncina» experimental farm, Lodi; 87 m a.s.l., Lat. 45°18'52"20 N, Lon. 09°30'14"04 E

Free stall barn, with forced ventilation

Tools: the meteorological station

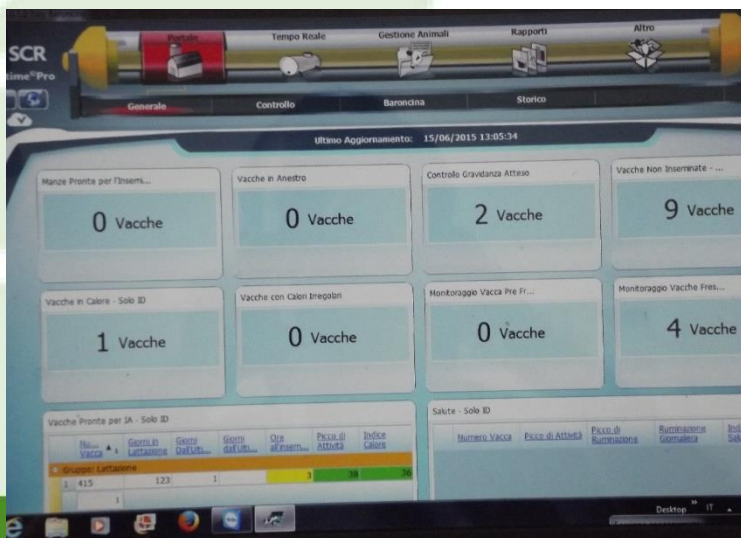


Tools: the TMR on-line analysis system (Dinamica Generale + Sgariboldi)



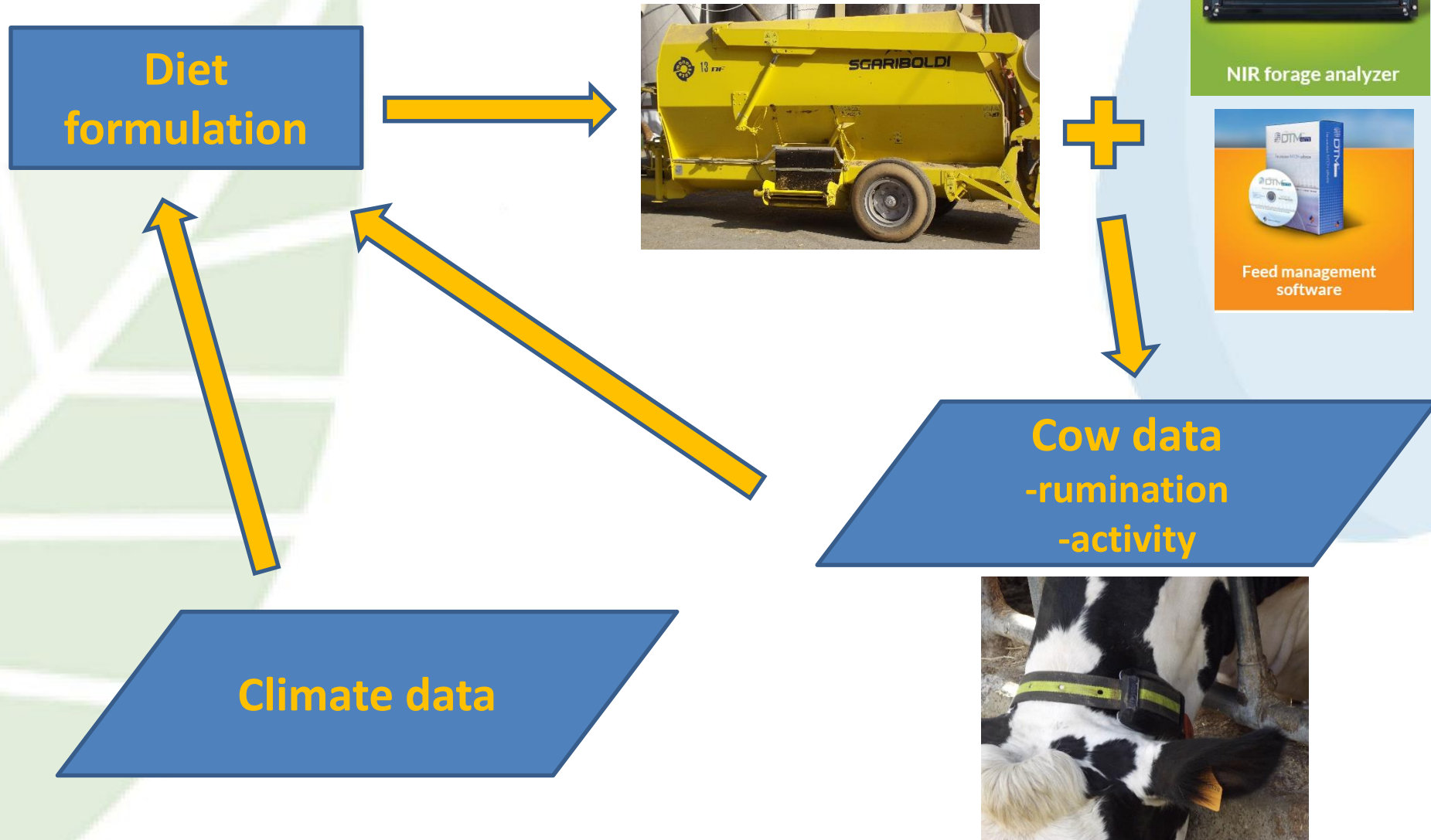
Tools: the SCR-SIVAM system

SCR Heatime® HR System



Material and Methods

The conceptual framework



Location and animals: the data set

3 groups selected according to DIM at the beginning of summer:

- a. Early lactation (15-84 DIM)
- b. Around peak of lactation (85-154 DIM)
- c. Plateau phase (155-224 DIM)

For each record:

Calving date – Parity – Reproductive stage (open, inseminated, pregnant)

Rumination data: minutes/2 h; total day-time rumination minutes (from 08:00 to 20:00); total night-time rumination minutes (from 20:00 to 08:00)

Activity data: activity acts/2 h; total day-time activity acts (from 08:00 to 20:00); total night-time activity acts (from 20:00 to 08:00)

Statistical analysis

2 ANOVA

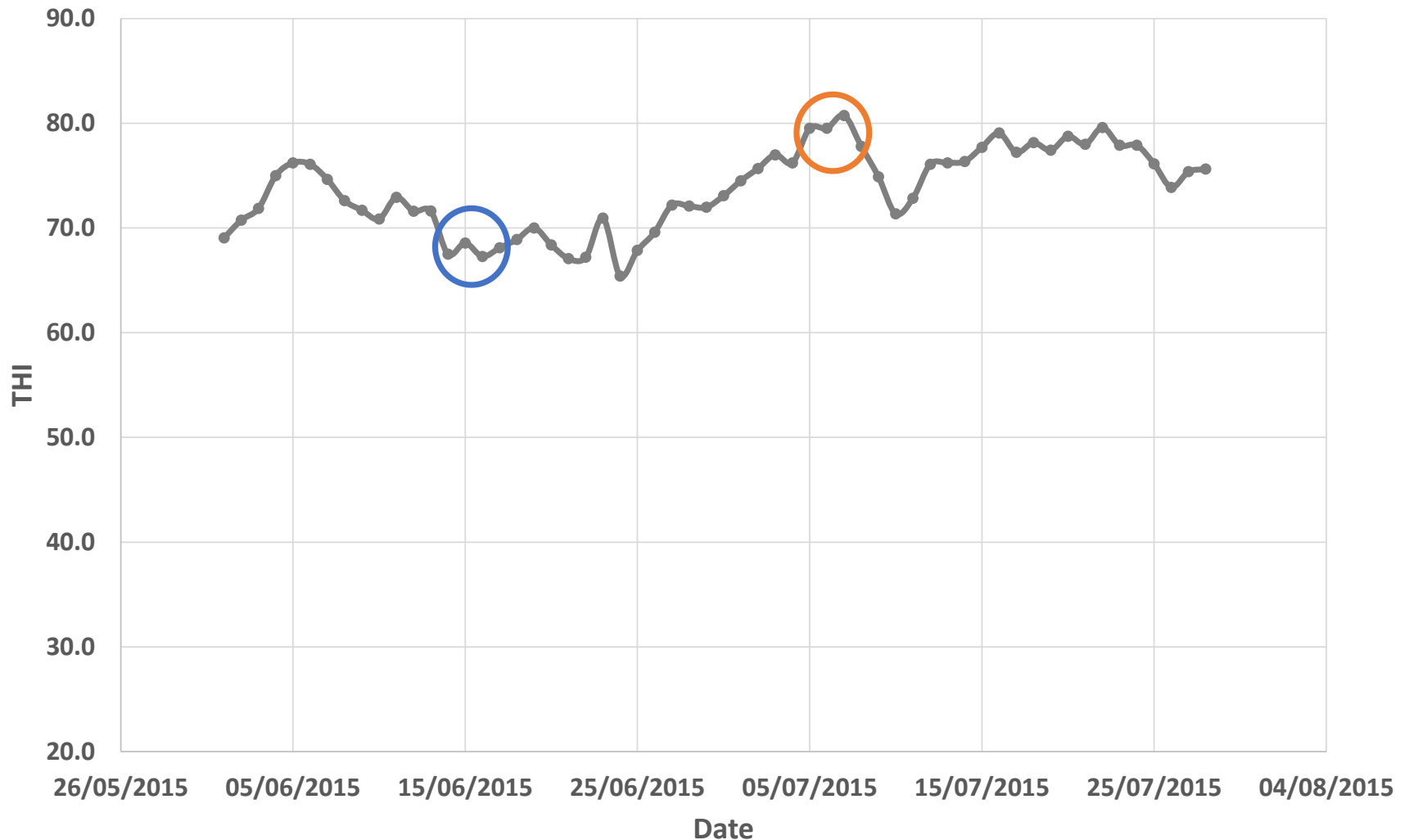
$Y_i = \mu + a(\text{day}) + b(\text{lactation stage}) + c(\text{day} \times \text{lactation stage}) + A[\text{cow}(\text{day} \times \text{lactation stage})_i] + e_i$ (for daily records)

$Y_i = \mu + a(\text{day}) + b(\text{lactation stage}) + c(\text{time of the day}) + d(\text{day} \times \text{lactation stage}) + e(\text{day} \times \text{time of the day}) + f(\text{lactation stage} \times \text{time of the day}) + A[\text{cow}(\text{day} \times \text{lactation stage})_i] + e_i$ (for hourly records)

Results and Discussion

Climate data

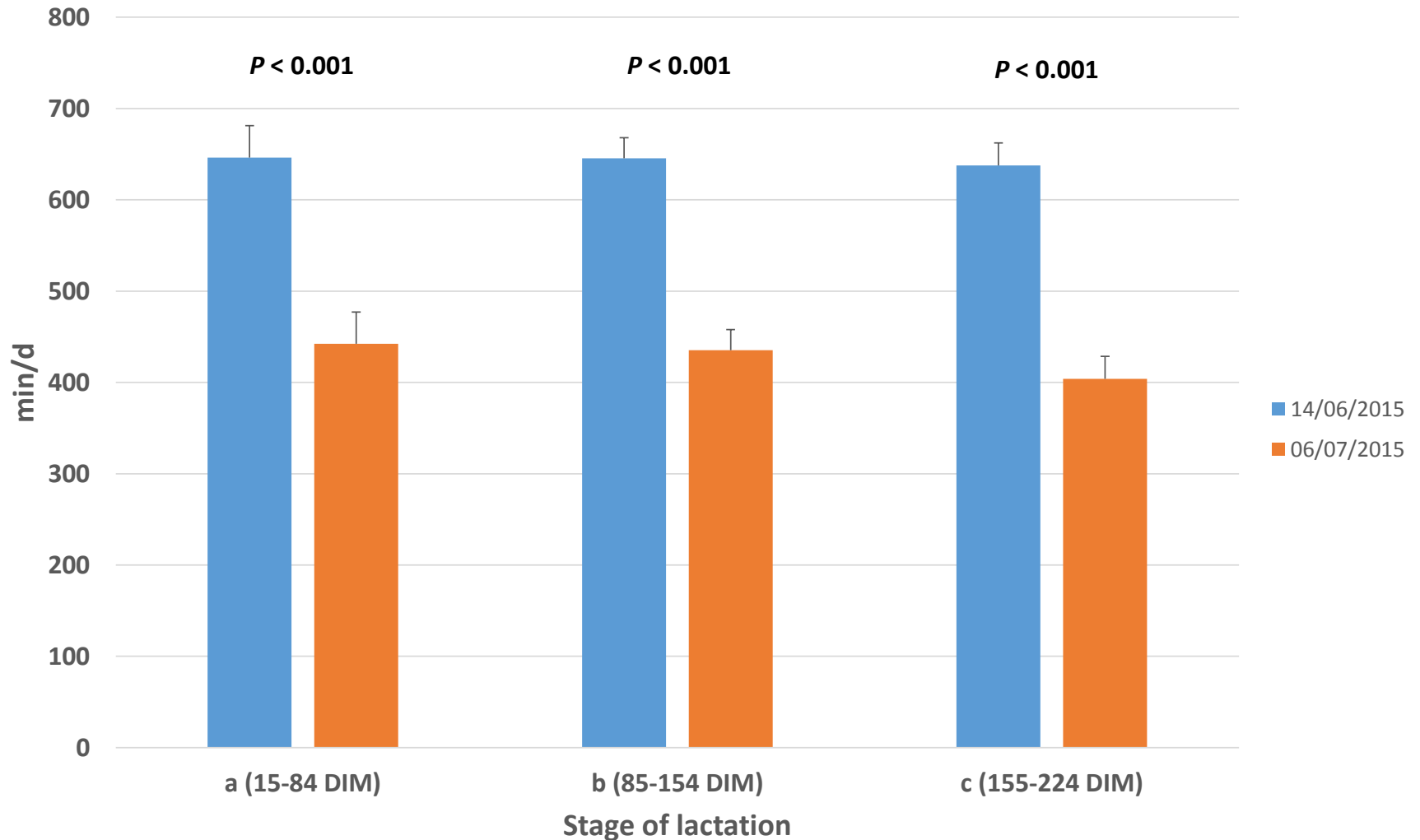
THI (Kelly and Bond, 1971)



Results and Discussion

Rumination data

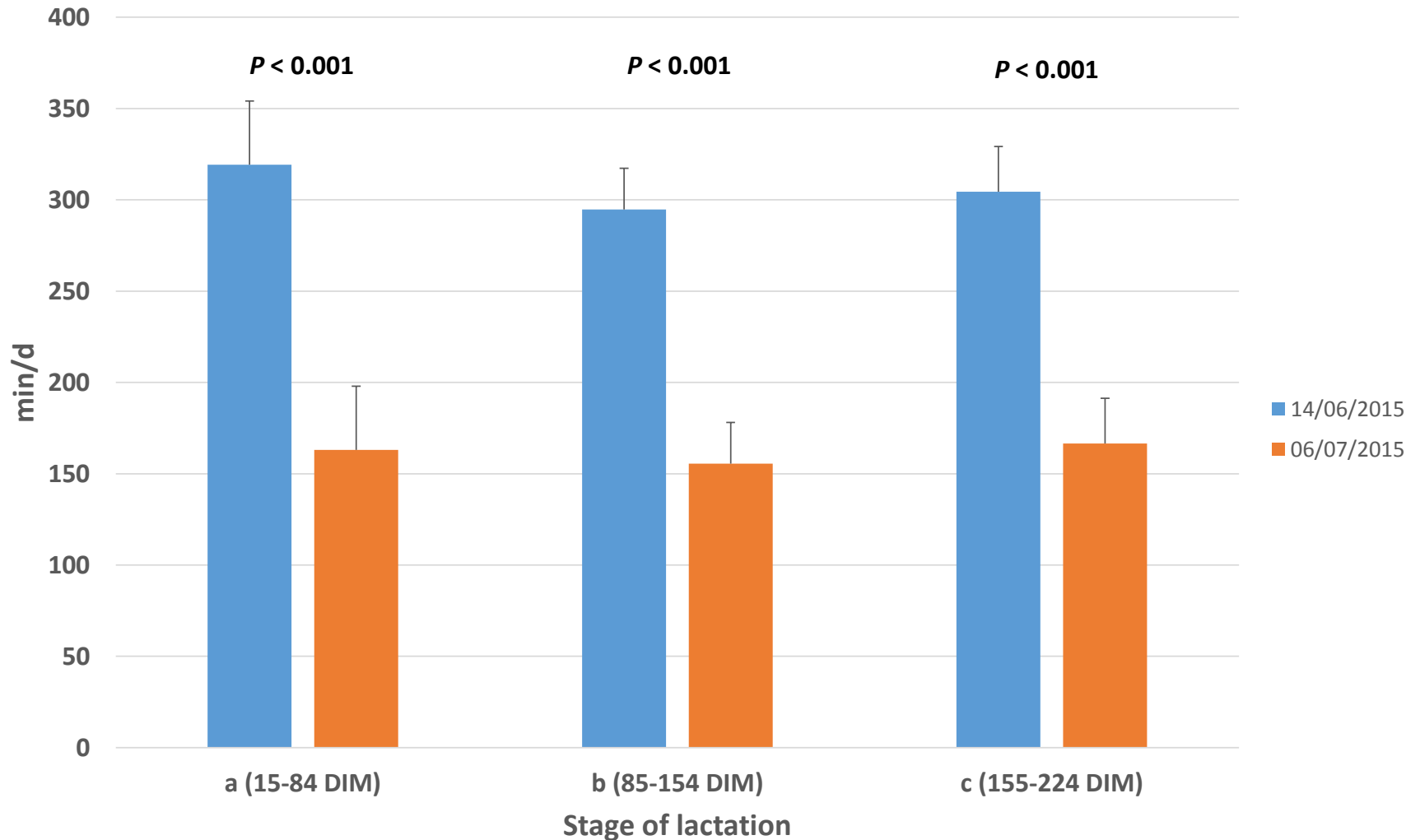
Total daily rumination time



Results and Discussion

Rumination data

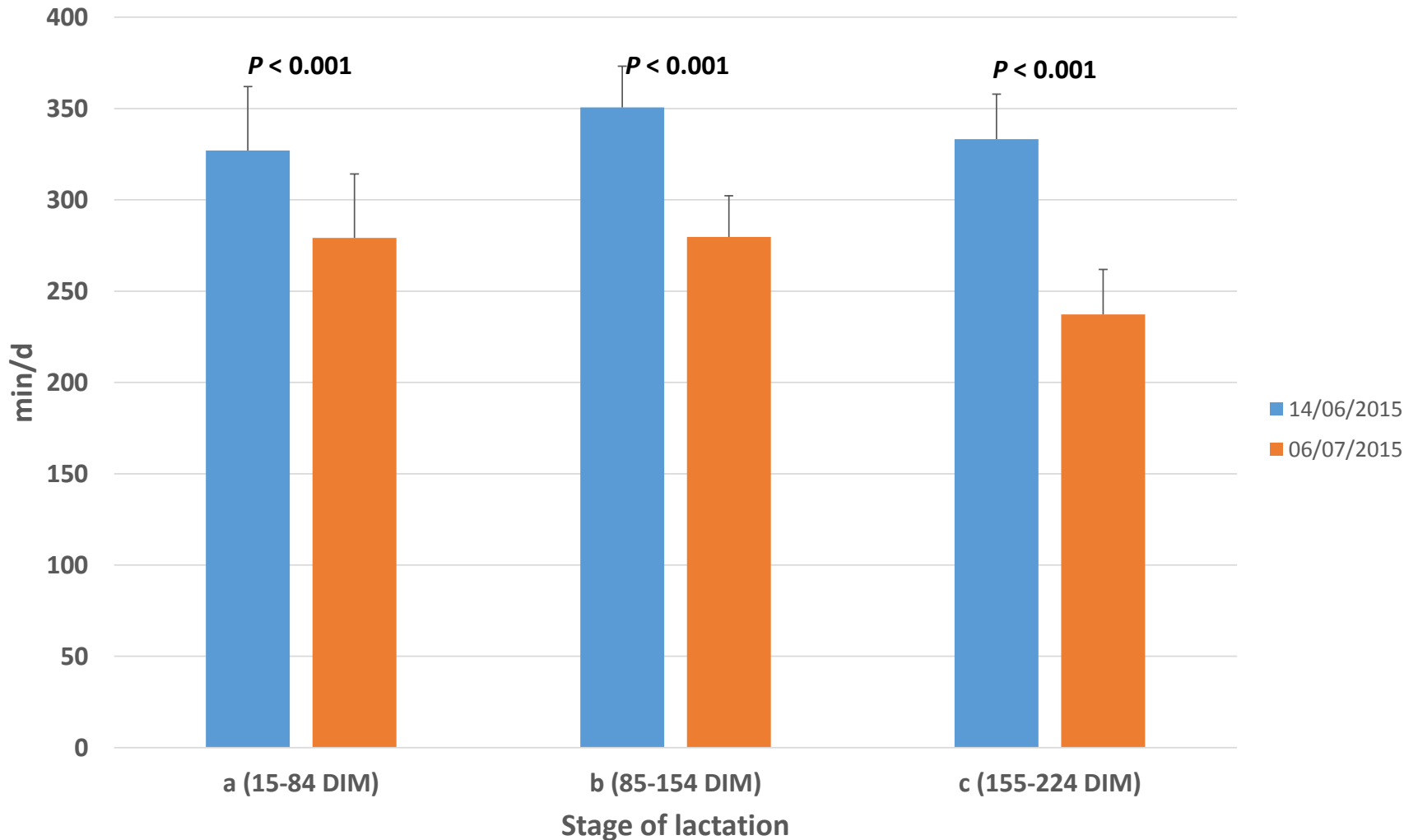
Day-time rumination time



Results and Discussion

Rumination data

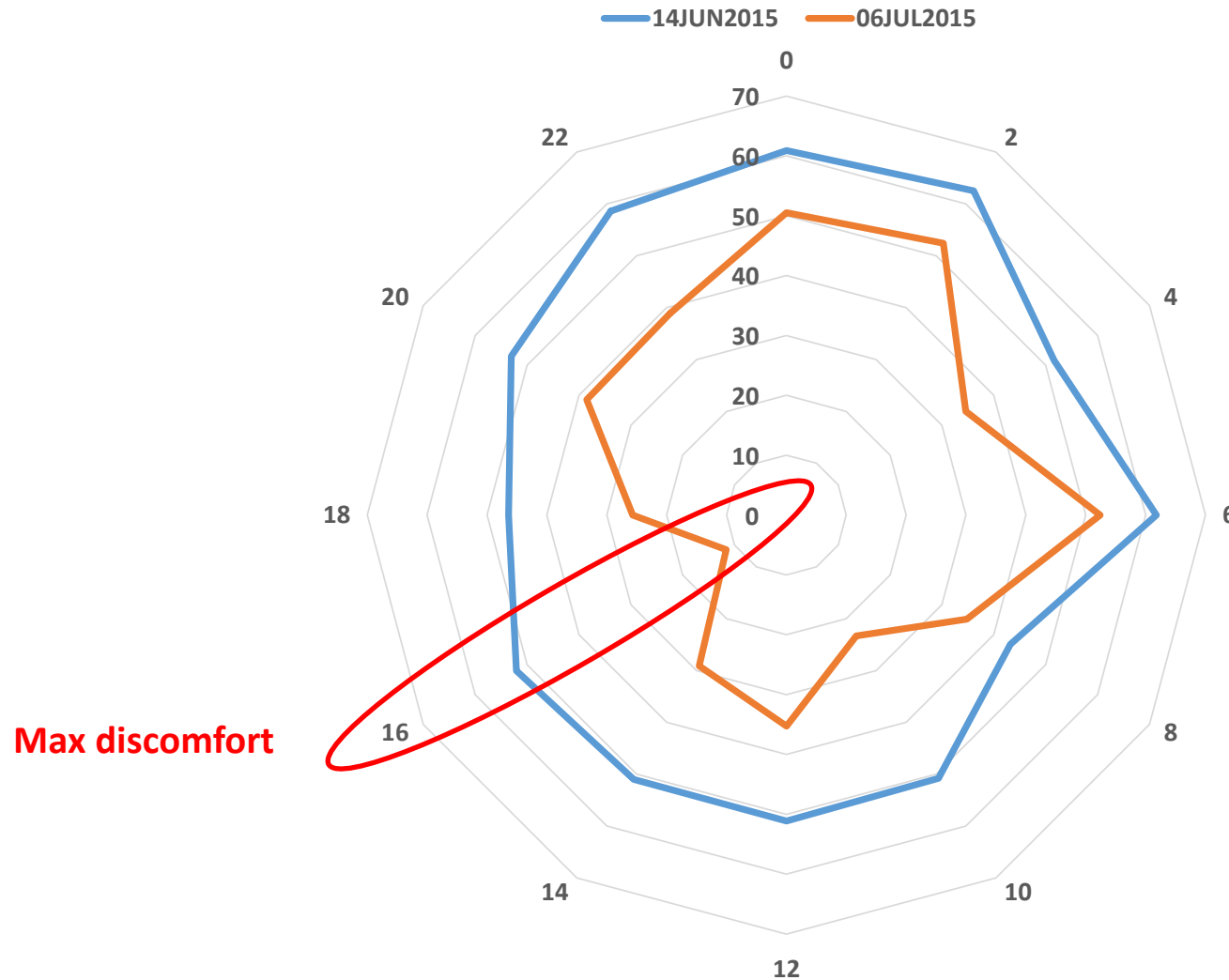
Night-time rumination time



Results and Discussion

Rumination data

Daily distribution of rumination activity (min/2 h intervals)



1. Climate effect on rumination

- ~ 30% reduction in all the stages of lactation during heat stress vs. thermoneutrality
- Reduction concentrated in day-time, less severe in night-time
 - Confirming Soriani et al. (2013)

2. Climate effect on production

- ~ 15% reduction during heat stress vs. thermoneutrality

- From a PLF perspective, we can try to differentiate 2 TMR in a day: one for the night-time (higher rumination) and one for the day-time (lower rumination)
- Further PLF tools would aid us to reduce the negative impact of heat stress on summer milk production, namely for PDO cheeses requiring a higher milk quality for the curd forming process

Dr. Antonio Bruni ("Baroncina" Farm manager)

Dairy Farm project



SIVAM + SCR



Sgariboldi



Dinamica Generale



OmniGen-AF

FIS