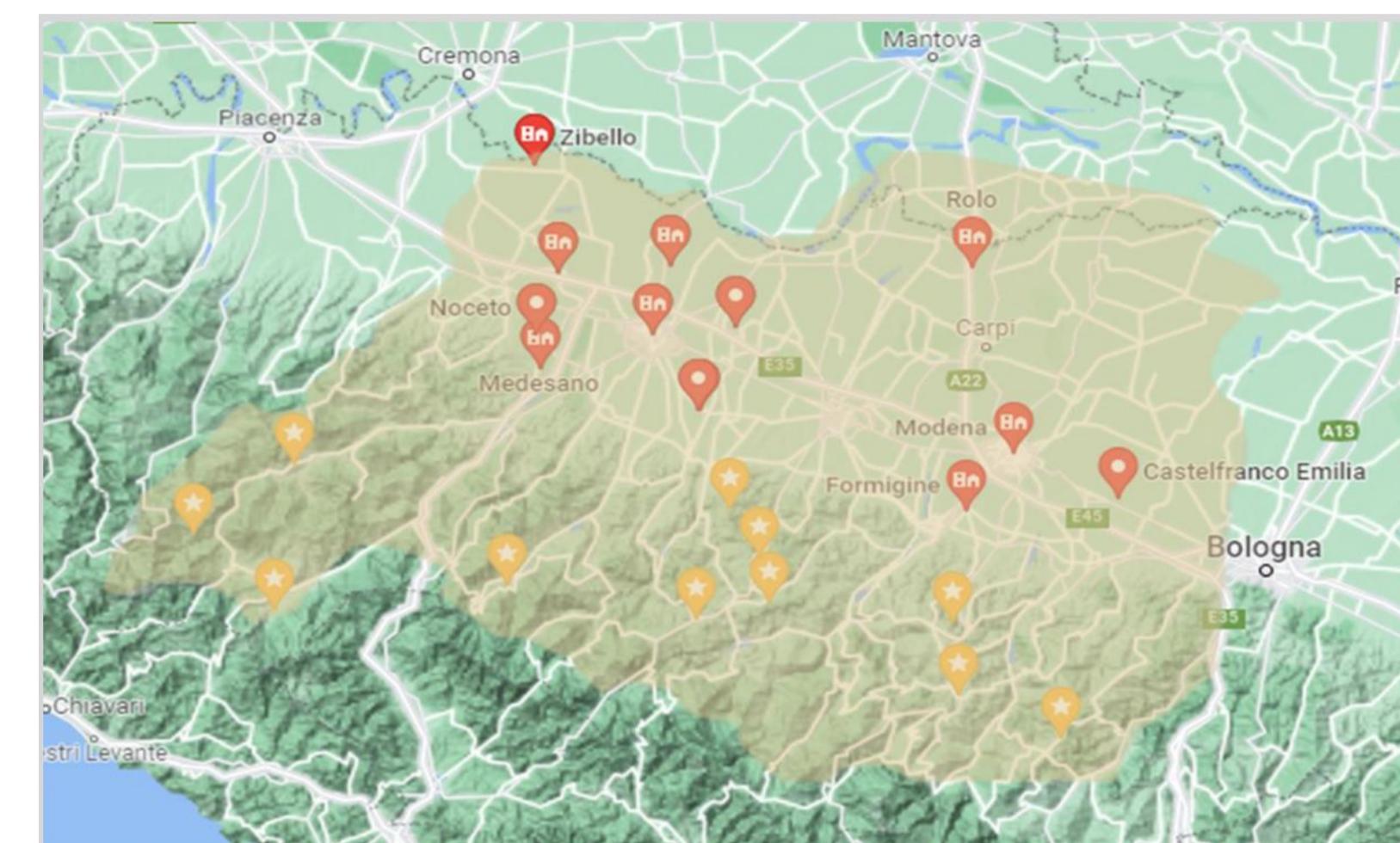


Lorenzo Strani¹, Caterina Durante¹, Juan Antonio Fernandez Pierna², Sara Michelini³, Valentina Pizzamiglio³, Marina Cocchi¹¹University Modena and Reggio Emilia, Department of Chemical and Geological Sciences, Via Campi 103, 41125 Modena, Italy²Walloon Agricultural Research Centre (CRA-W), Quality of Agricultural Products Department, Chaussée de Namur 24, 5030 Gembloux, Belgium³Consorzio del Formaggio Parmigiano Reggiano, Via Kennedy 18, 41214 Reggio Emilia, Italy

BACKGROUND

“Mountain Product” is a relatively new quality label defined in the European Community regulation reserved for food products produced and processed in **mountain areas**, aiming to support the economy in disadvantaged areas. However, the “Mountain Product” denomination is still not enough spread and not well known by consumers. Both dairy farmers and consortia want to **protect the authenticity** of their products from analogues and, at the same time, **promote** them.



AIM

Assessing, among different samples of Parmigiano Reggiano (PR), the ones with the **mountain denomination**, through fast and non-destructive spectroscopic techniques

SAMPLING

80 PR samples:

- 60 from **Mountain** areas (40 cal/20 val)
- 20 from **Plain** areas (15 cal/5 val)

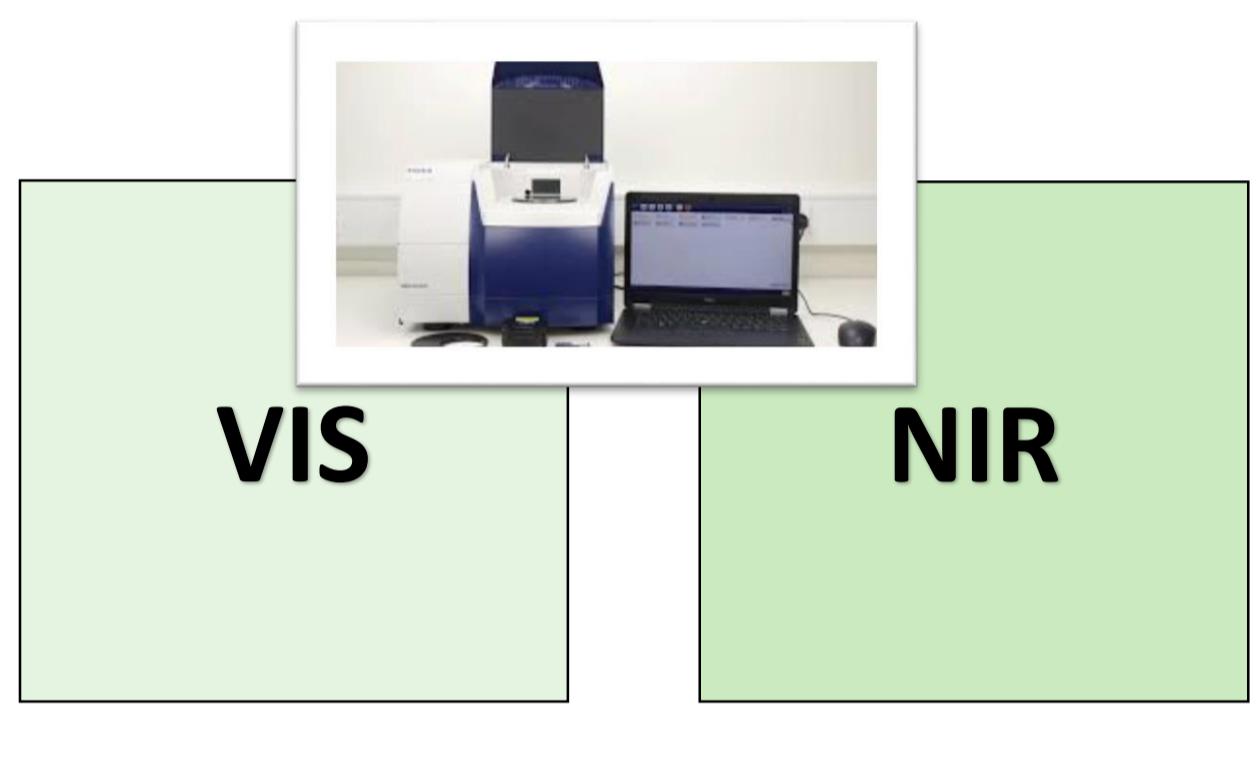
40 different suppliers in 5 Provinces

SPECTROSCOPIC TECHNIQUES AND DATA TREATMENT

Vis-NIR (benchtop):

Foss NIRS DS3

400-2500 nm



VIS

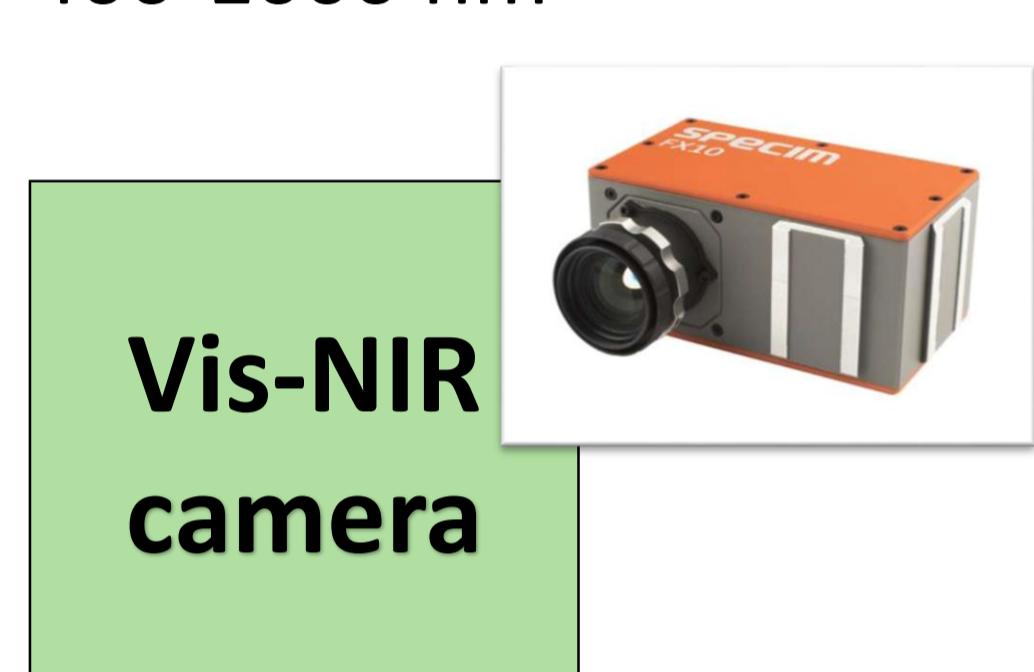
NIR

SNV

Vis-NIR (Camera):

Camera Specim FX10

400-1000 nm

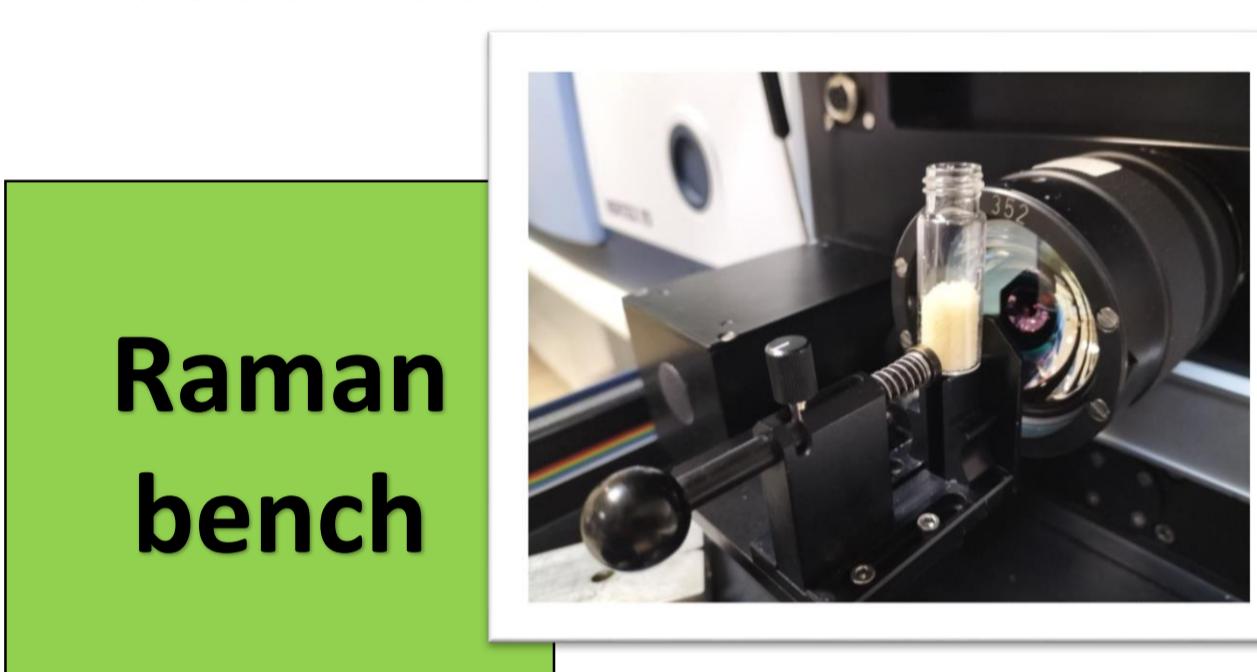


Vis-NIR camera

SNV

Raman (benchtop):

Bruker RAM II

3600-200 cm^{-1} 

Raman bench

SG Smoothing
Normalization

Raman (portable):

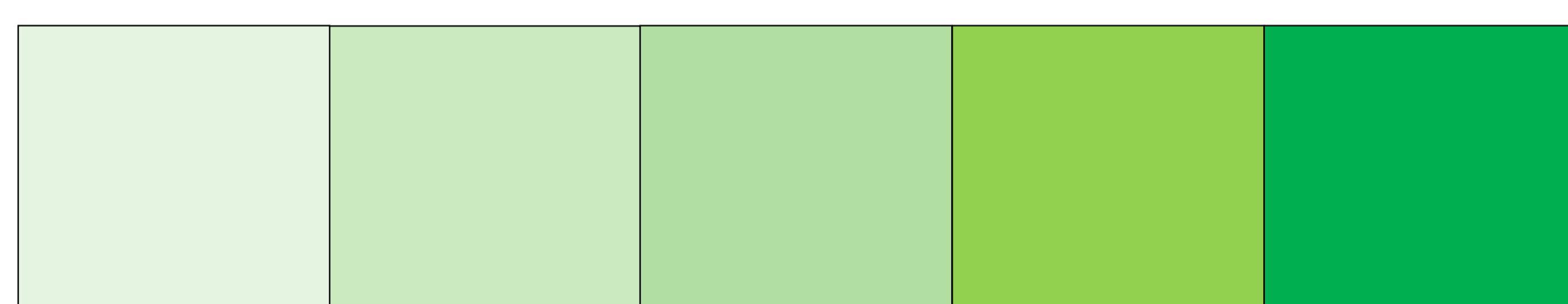
Rigaku Progeny

2500-150 cm^{-1} 

Raman portable

Baseline correction (AWF)
Normalization

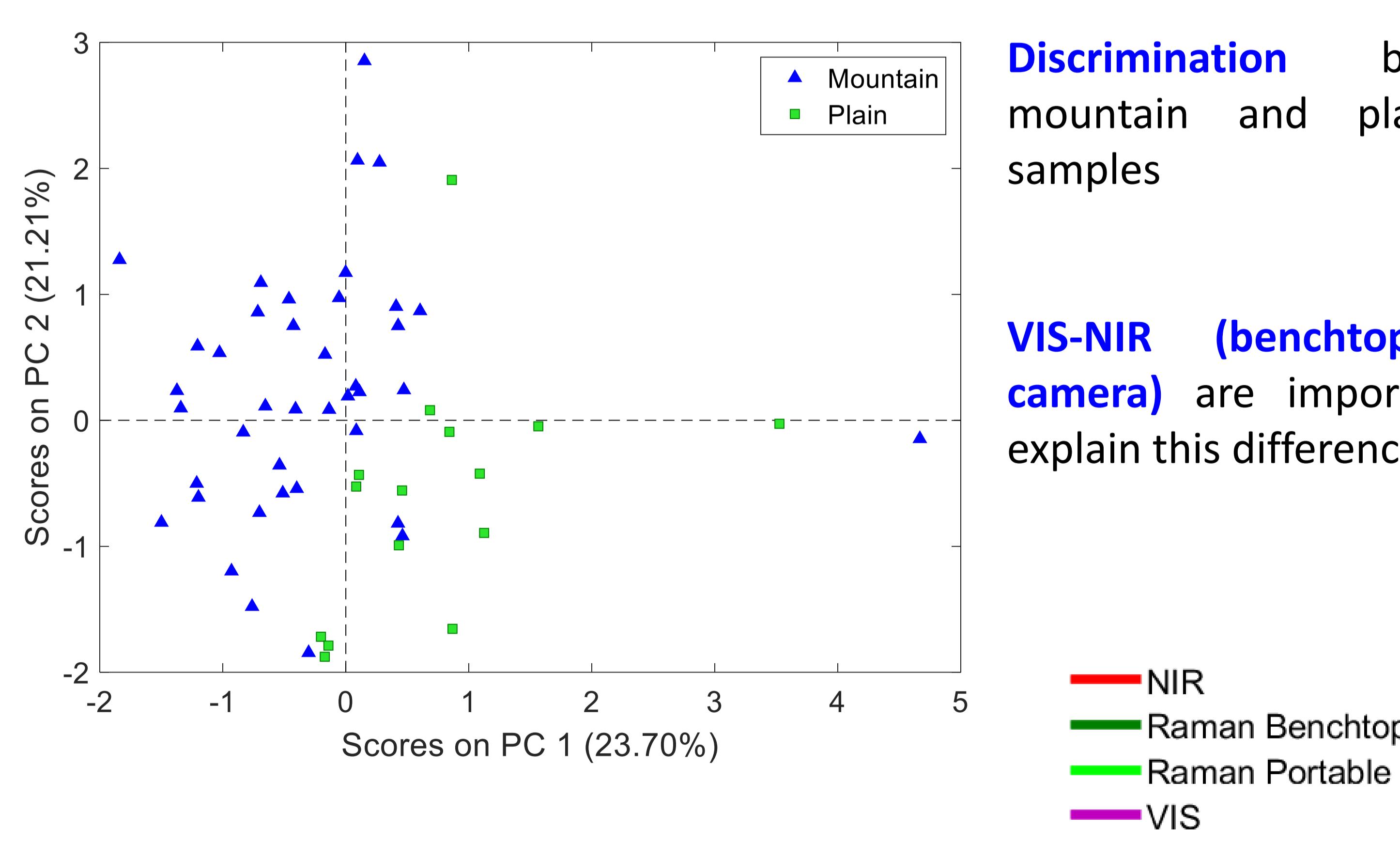
Low Level Data Fusion

Block Variance
Scaling

Data analysis

RESULTS

PCA

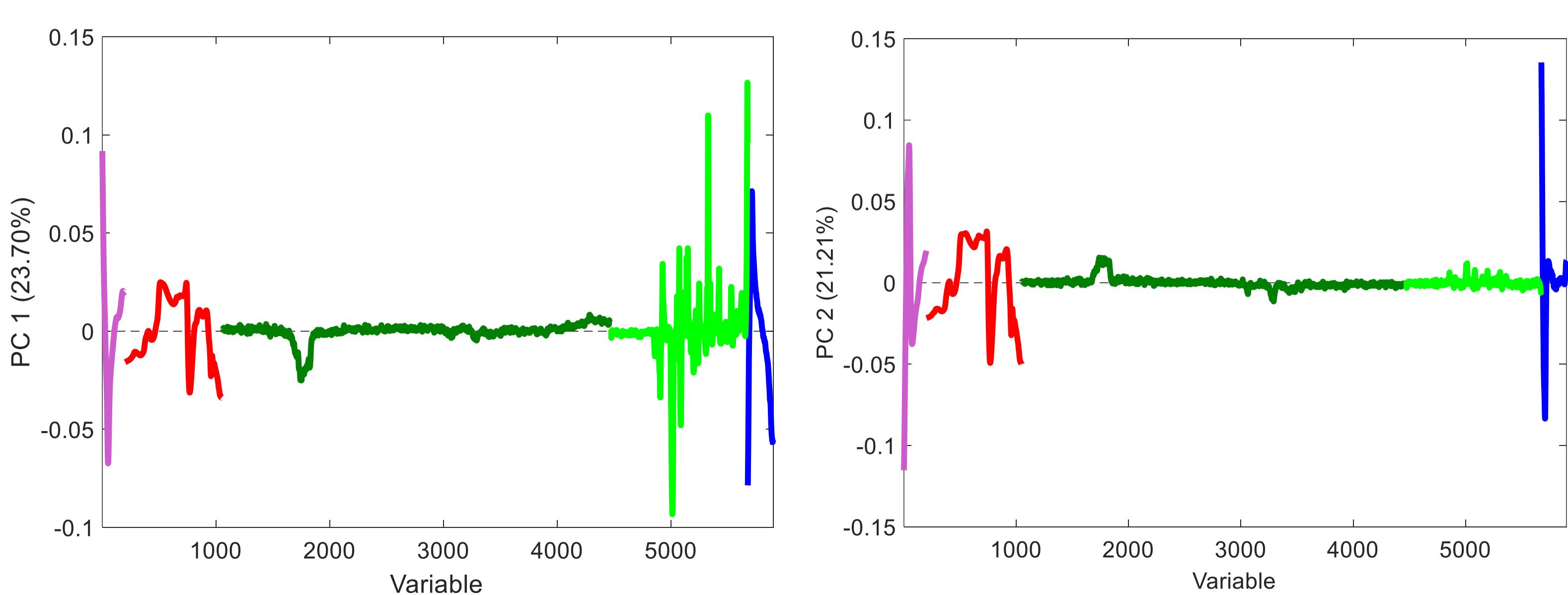


Discrimination between mountain and plain PR samples

VIS-NIR (benchtop and camera) are important to explain this difference

SIMCA

| Techniques | PC | Sensitivity (%) CV | Specificity (%) CV | Sensitivity (%) Pred | Specificity (%) Pred |
|------------------|----|--------------------|--------------------|----------------------|----------------------|
| All | 7 | 100 | 73 | 90 | 60 |
| VIS | 6 | 100 | 46.6 | 90 | 40 |
| NIR | 6 | 90 | 33.3 | 80 | 20 |
| VIS-NIR (camera) | 5 | 97.5 | 66.6 | 80 | 60 |
| Raman (bench) | 6 | 100 | 33.3 | 65 | 20 |
| Raman (portable) | 5 | 97.5 | 33.3 | 60 | 0 |



CONCLUSIONS

Through PCA it was possible to observe **differences** between **mountain** and **plain** PR samples, highlighted by Visible and Raman spectroscopies.

The **fusion** of different data blocks allowed to obtain **better results** in terms of classification performance.

ACKNOWLEDGEMENTS

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