Dornach (CH) – September 5th to 8th 2018
1st International Conference on Biodynamic Research
Evolving Agriculture and Food - Opening up Biodynamic Research

Session IV C: Biodynamic breeding and animal welfare

Investigation of the internal atmosphere of hives of different typologies hosting colonies of European domestic bees

ApiSophia
Sabrina Menestrina, Luca Mion

ApiSophia

Is a young no-profit Italian Association of Social Promotion (APS) with a board composed of 6 people and a number of about 50 supporting members

ApiSophia deals with the welfare of bees,
the realization of Sun Hives,
the promotion of sowing of flowers for bees,
research in biodynamic beekeeping
and more...

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What is our mission at this Convention?

Disseminate and share the results of some of our observations and measurements that may help future research on the welfare of bees

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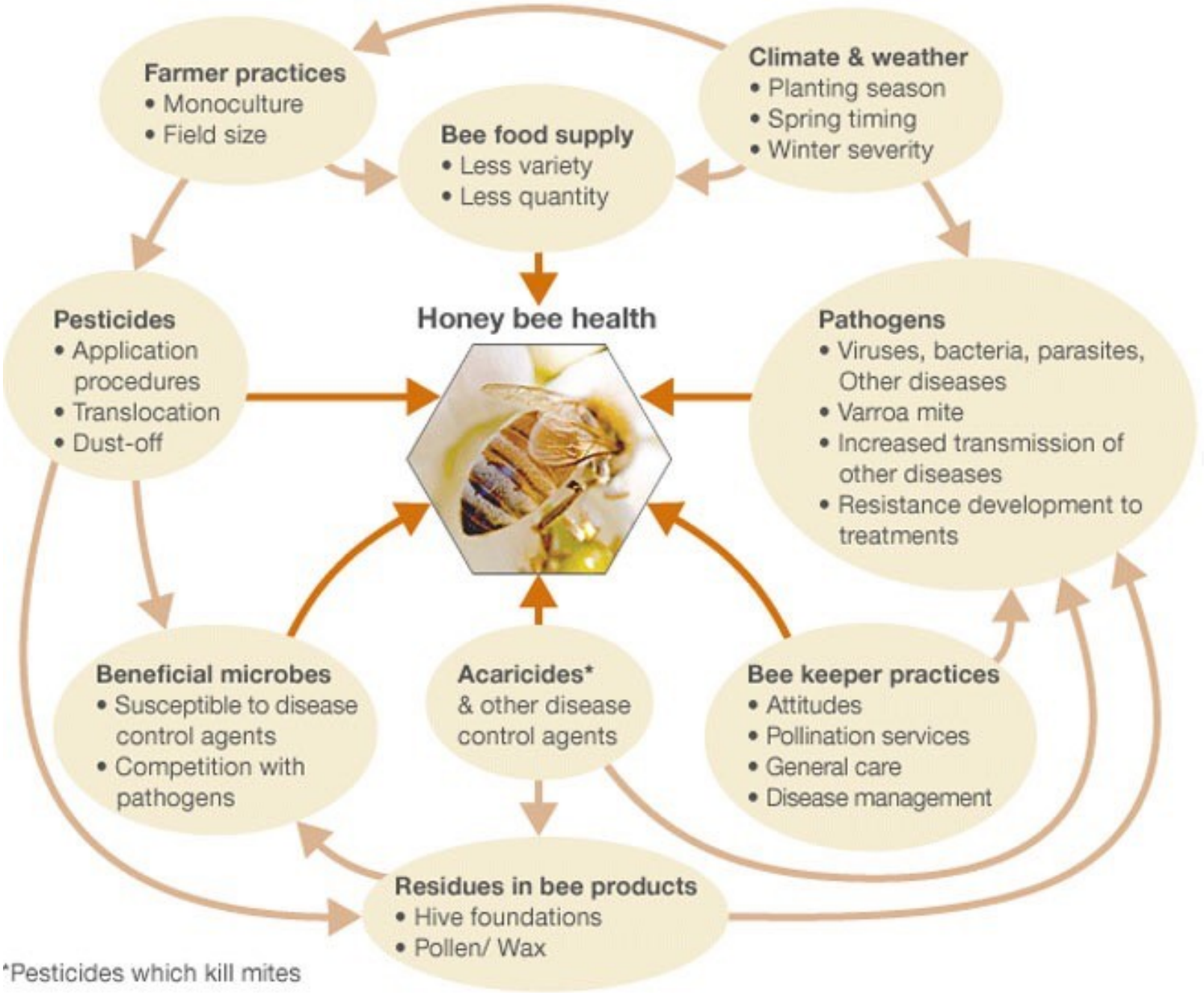
What is the "problem" for the bees?

Stress Factors on Honey Bee Health



*Pesticides which kill mites

Source: OPERA Bee health in Europe, 2013

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Varroa Destructor mite and effect of resulting viral attacks

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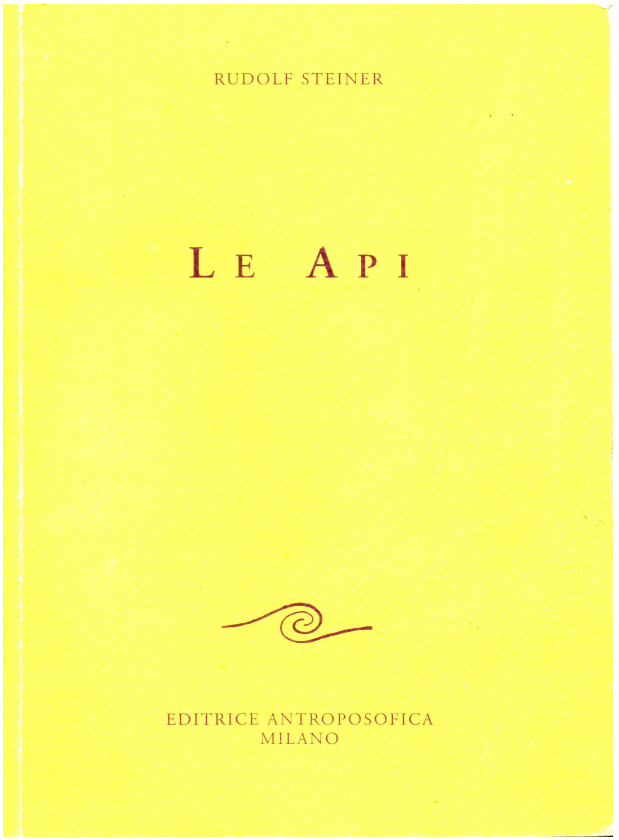
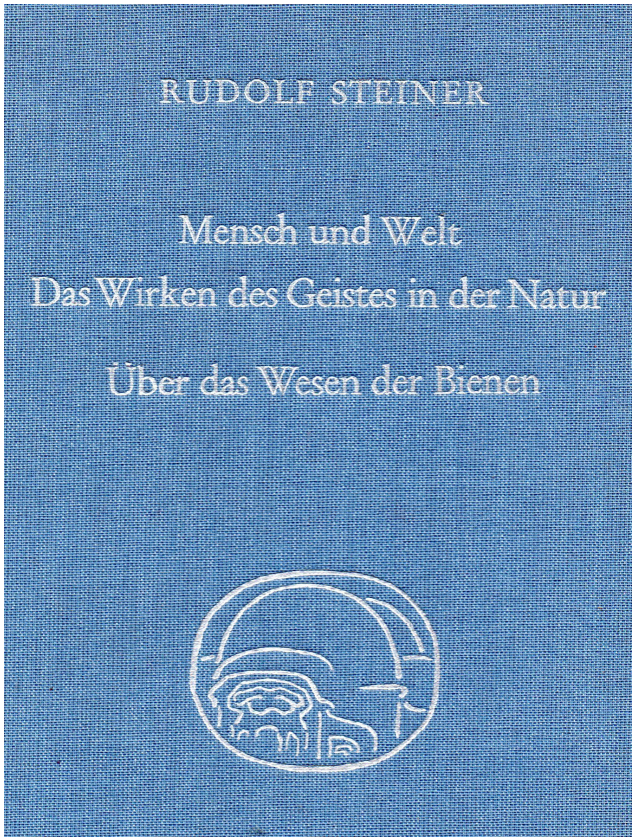
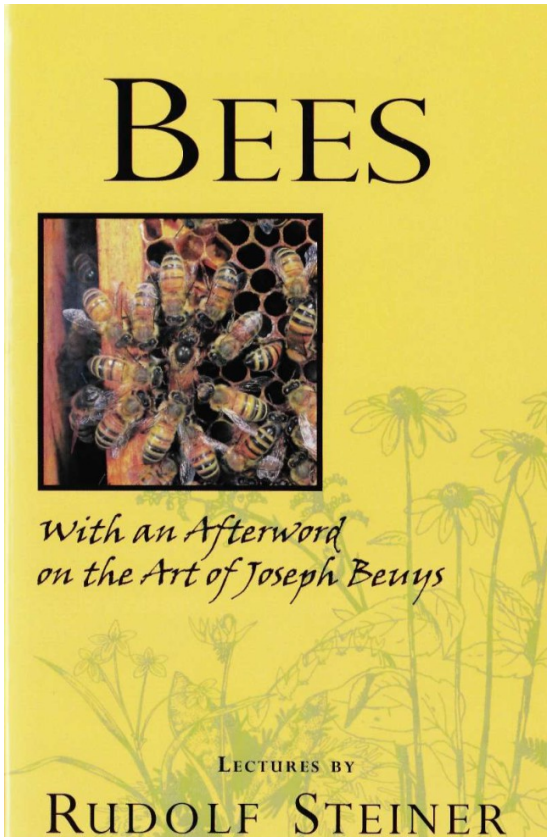
Rudolf Steiner and the Biodynamic Beekeeping...







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Rudolf Steiner O.O. 351 “Le Api”
Dornach, 10 dicembre 1923

...“Se si vogliono vincere le nuove malattie che sono sorte nelle api, sarà della massima importanza trovare la giusta disposizione per un retto rapporto tra succo gastrico e succo sanguigno nelle api.”...

...”If you want to gain control over such bee diseases as those that have appeared recently, it will depend in large part on bringing about the appropriate effect by regulating and attaining the properly balanced relationship between the bee's gastric and blood juices.”...

(**prof. Michele Codogno**)

Animal healt is ensured by a correct relationship between metabolism and internal homeostasis by the polarity of the following two actions: transformation and maintenance. According to Rudolf Steiner (1923), a symptom to assess this state of health is given by the contant relationship over time:

Gastric Juice of bees (pH Acid)

Blood juice (Hemolymph) of bees (pH Basic)

at optimal values.

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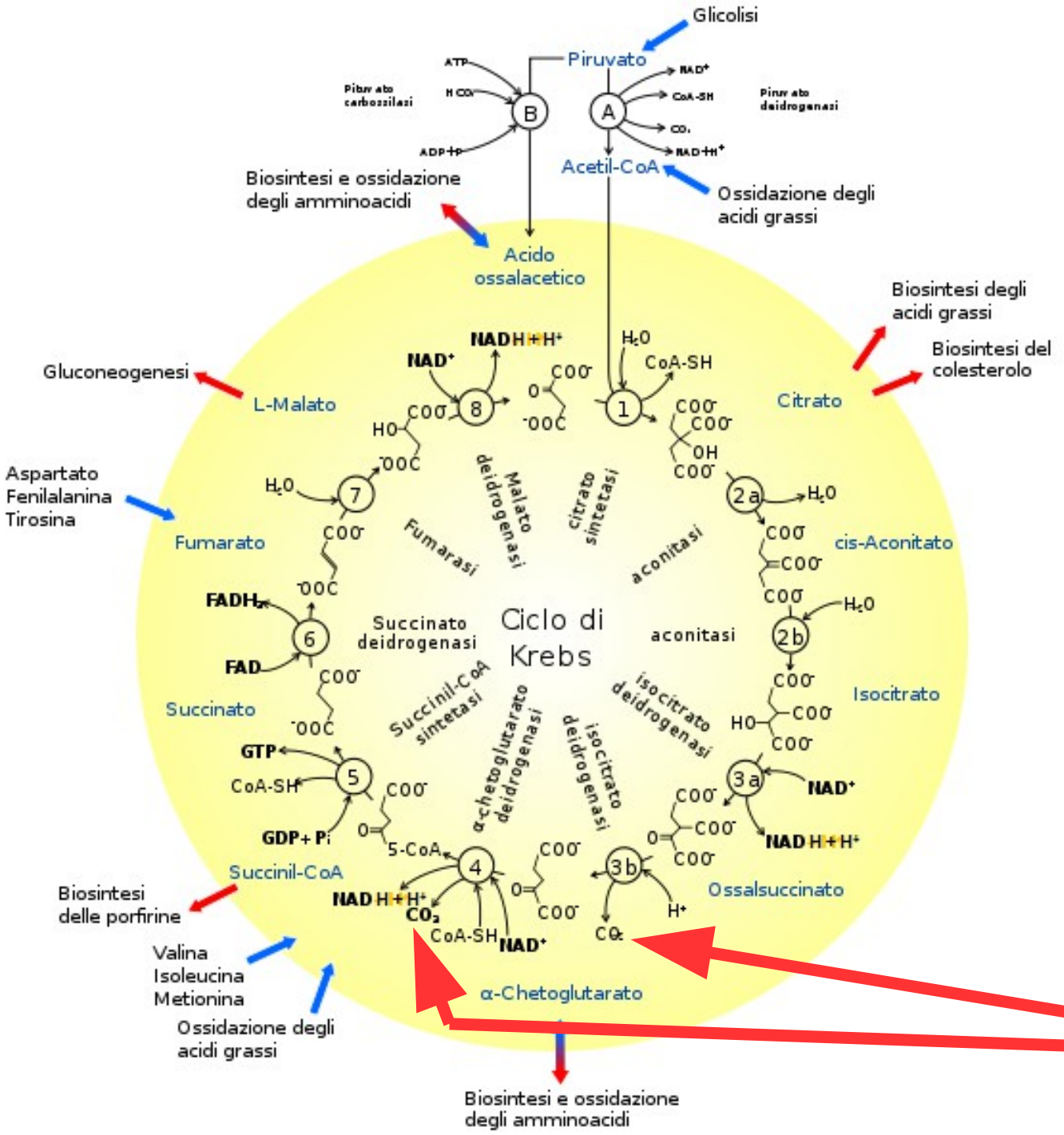

Krebs Cycle or Citric Acid Cycle

CO_2 Production

The Carbon Dioxide CO_2

produced by the bees is concentrated inside the hive and depends (above all) on the internal temperature and on the rate of ventilation

The internal Temperature of the beehives

in the hottest spots, can generally vary from
25 °C (no brood) to
36-37 °C with the presence of brood

The Carbon Dioxide CO_2 Concentration

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In the external environment: 400ppm = 0.04%

Exhaled by man: 45,000ppm = 4.5%

Produced from the beehive?

In the following slides we will see
what is officially known
and
what were the results of our surveys ...

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1974 – Thomas D.Seeley
Cornell University (USA)

"Atmospheric Carbon Dioxide Regulation in honey-bee (Apis Mellifera) colonies"

Detects Carbon Dioxide Concentrations
in the range:

[0.1% - 4.25%]

2011 – Kozak P.R., Currie R.W.
University of Manitoba (Canada)

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"Laboratory study on the effects of temperature and three ventilation rates on infestations of Varroa destructor in clusters of honey bees (Hymenoptera:Apidae)"

Detects Carbon Dioxide Concentrations in the range:
[0.1% - 4.25%] **summer**
[4% - 6%] **winter** (with bees metabolism reduced by 200 times)

In the laboratory, at 25 °C, with low ventilation (14 l/h)
and a CO_2 concentration of 2.13%

they get a mortality of Varroa mites by 46%

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2015 – Bahreini R., Currie R.W.
University of Manitoba (Canada)

"The Potential of Bee-Generated Carbon Dioxide for Control of Varroa Mite (Mesostigmata:Varroidae) in Indoor Overwintering Honey bee (Hymenoptera Apidae) Colonies"

In the laboratory with a very low ventilation (0,24 l/h)
and a CO_2 concentration of 3,82% (range 0,43% – 8,44%)

they get a mortality of Varroa mites by 37%

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A structured "Research project" of ApiSophia is born

with the aim of observing and monitoring the atmospheres inside the hives of different shapes (internal CO_2 and T° - external U% and T°)

The variables are really many to consider:
now we are in the first operational phase of data collection and observations to create a "**general picture**" of the different situations

The goal is not to "**contrast**" the diseases but favoring the "**salutogenesis**" of the beehive with reference primarily to the needs of his physical body (physical hive and wax honeycombs)

Measure campaign
Detection form - First part

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DATA: ……../……./…… ☐**CALORE** ☐**TERRA** ☐ **LUCE** ☐**ACQUA** Note……

APIARIO:……

Osservazioni (es. ambiente circostante): ……..

CUSTODE:……..

Osservazioni (es. tipo gestione, temperamento):……

OPERATORE-OSSERVATORE:……

Osservazioni (es. stato d'animo):……

ARNIA - FAMIGLIA: ……

Tipologia arnia:…….. Fondo: ……

Forma, dimensioni e posizione ingresso:……...

Consistenza famiglia:…….....

Sottospecie:…….....Data precedente apertura arnia: ……../……../……

Osservazioni (es: presenza e tipo volo api, importazioni polline, guardiania, grooming)

……

Measure campaign
Detection form - Second part

Indicazioni metereologiche (es.: sole, parz. sole, coperto):……

T° (ambiente sessione): ……**°C**

U% (ambiente sessione): ……**%**

Orario inizio misura [hh:mm:ss]	**Punto di misura**	**CO_2** [%]	**T** [°C]	**Note**

Instrumentation used initially

KITAGAWA CO_2 NDIR meter with suction pump and detection vials for different concentrations of CO_2

First measurements in summer 2017 with CO_2 values measured centrally under the covers of the hives in the order of:
0.04% (background value) - 0.1%

Various operational problems...

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Instrumentation used later

- Datalogger CM-0010 (10% CO2) CO2METER (USA)
- Various probes for CO_2 and T°
- Digital thermometer TESTO 925 (Italy) with K-temperature probe
- Thermohygrometer TESTO 608-H1 (Italy) for external environment

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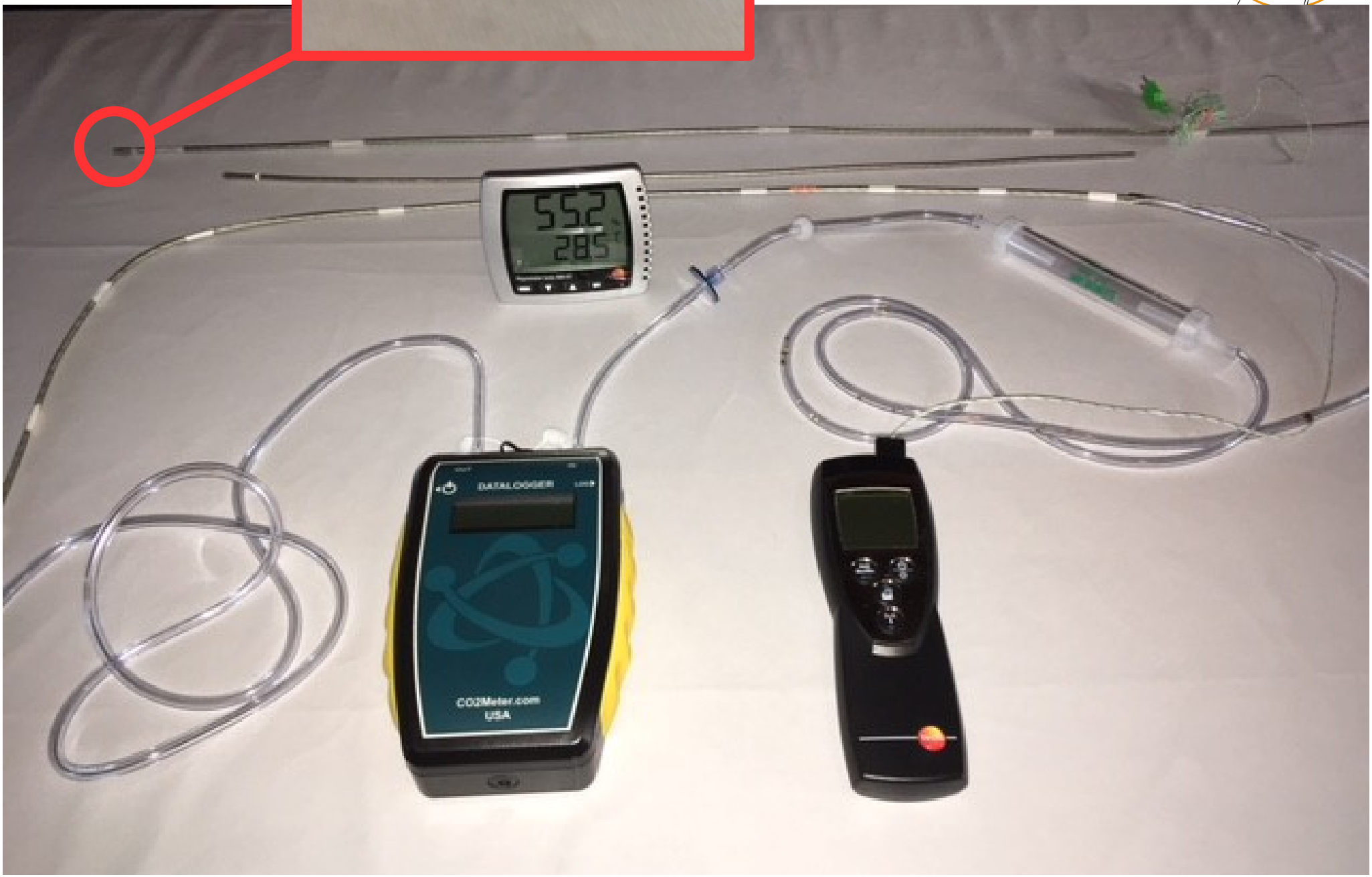
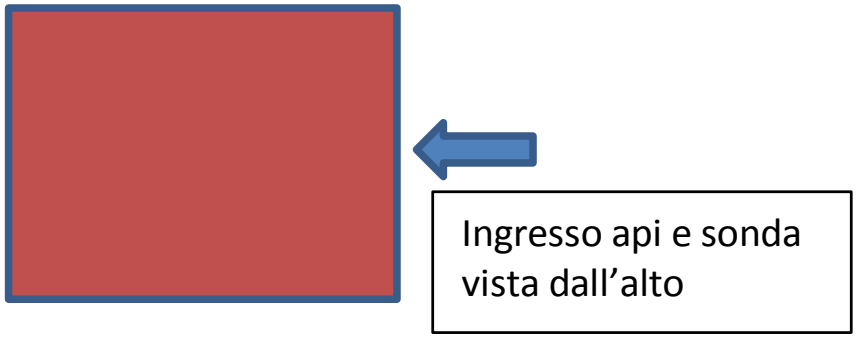
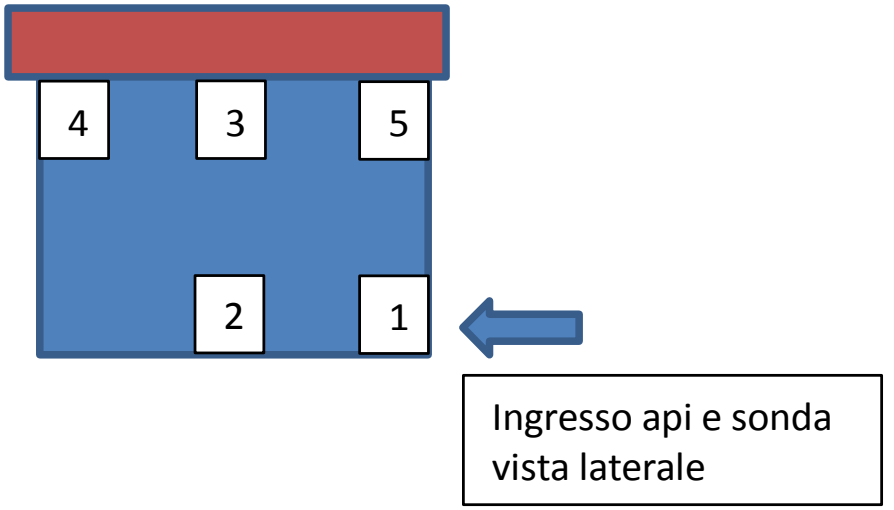


Views of a classic beehive and probes access position



View from above with central entrance of the probe and bees



Lateral view with the measurement positions within the beehive

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In this first phase of investigation what we wont to know is whether the beehive organism, under certain conditions, is able to develop heat and Carbon dioxide in a significant degree and in interesting positions

Beehive Dadant-Blatt (DB-10) with fixed wooden base

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Beehive Dadant-Blatt (DB-10) with open bottom with steel net

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First campaign: winter 2017- 2018

First campaign: winter 2017-2018

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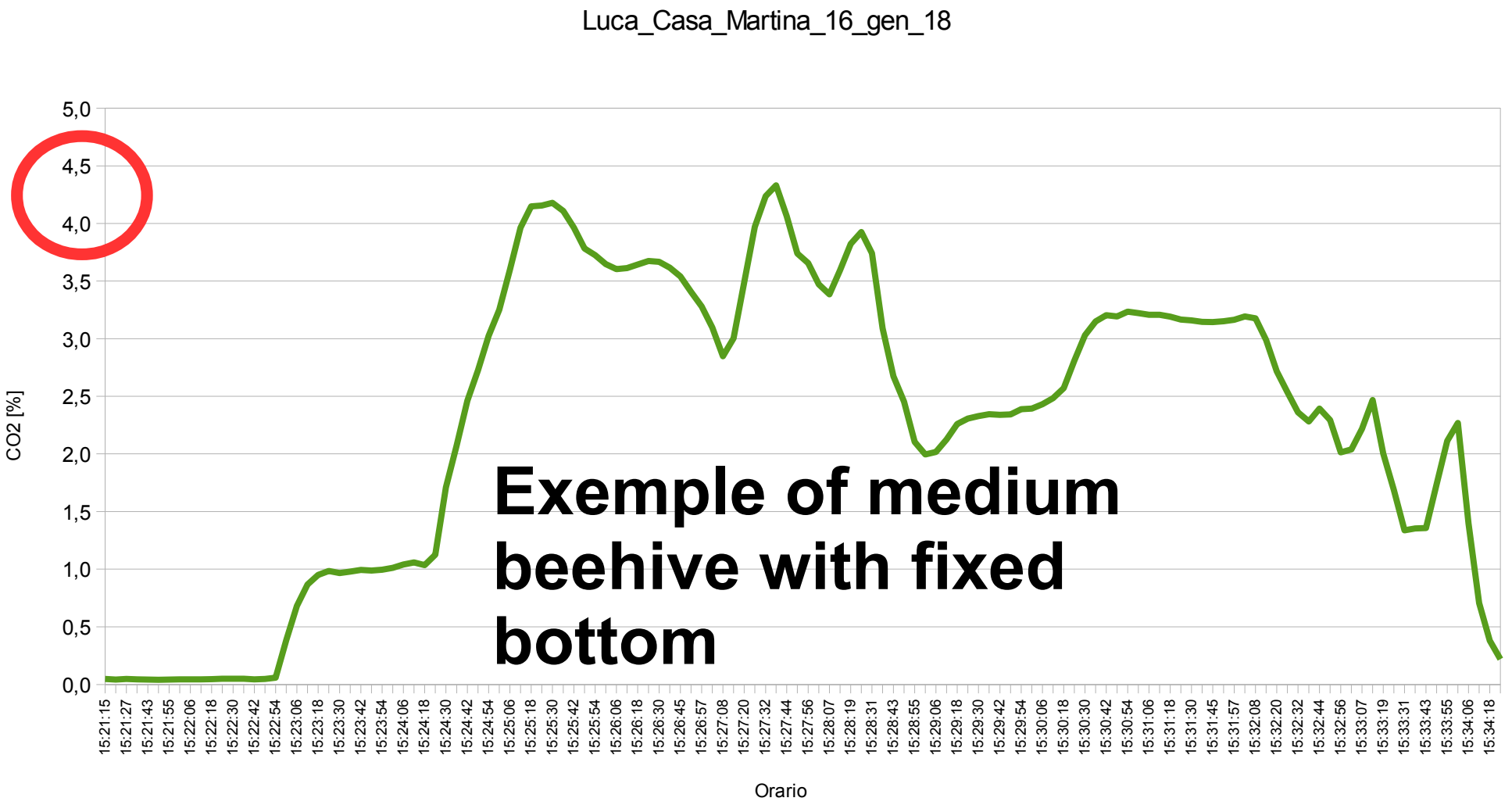

First campaign: winter 2018

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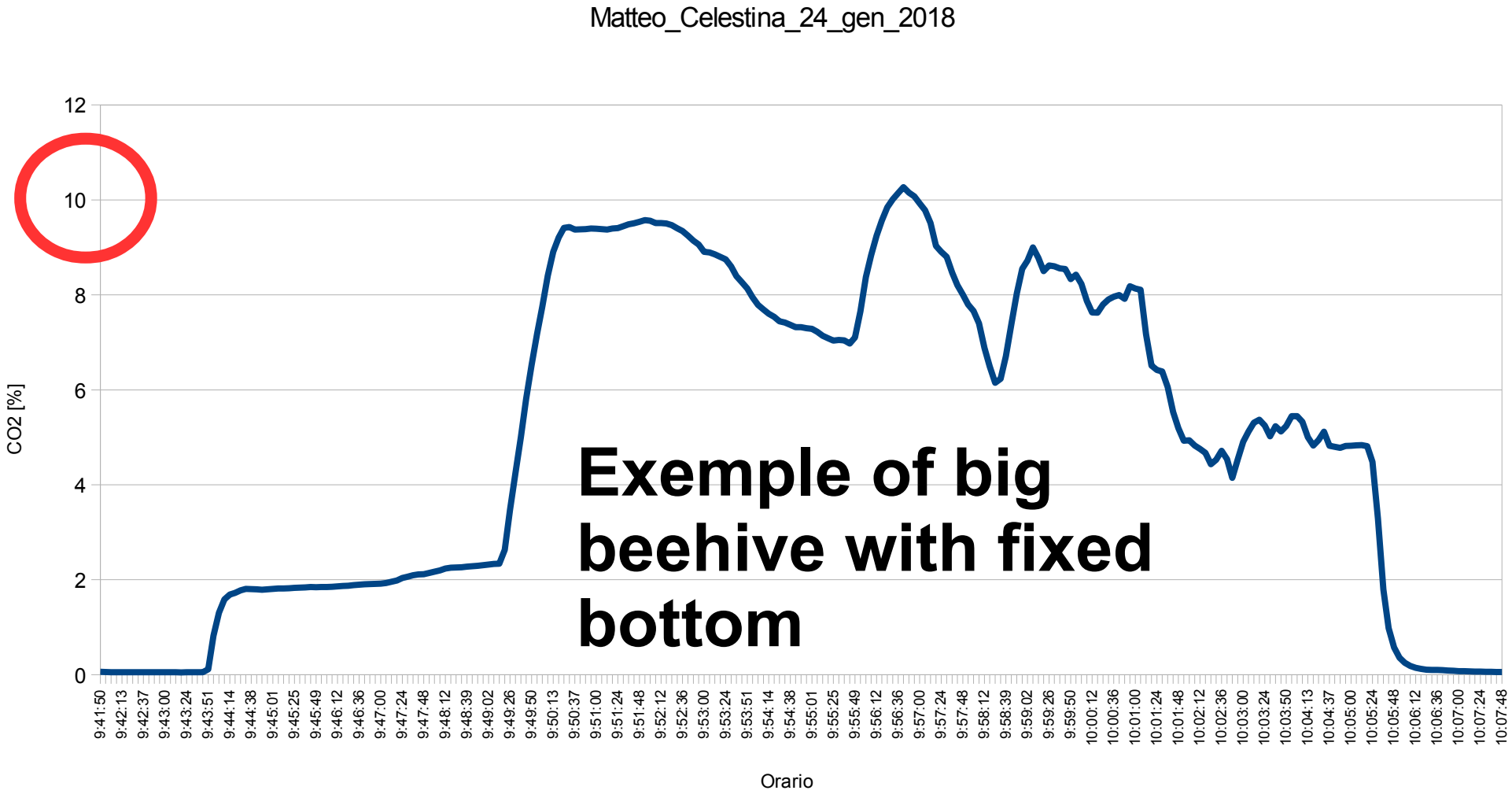
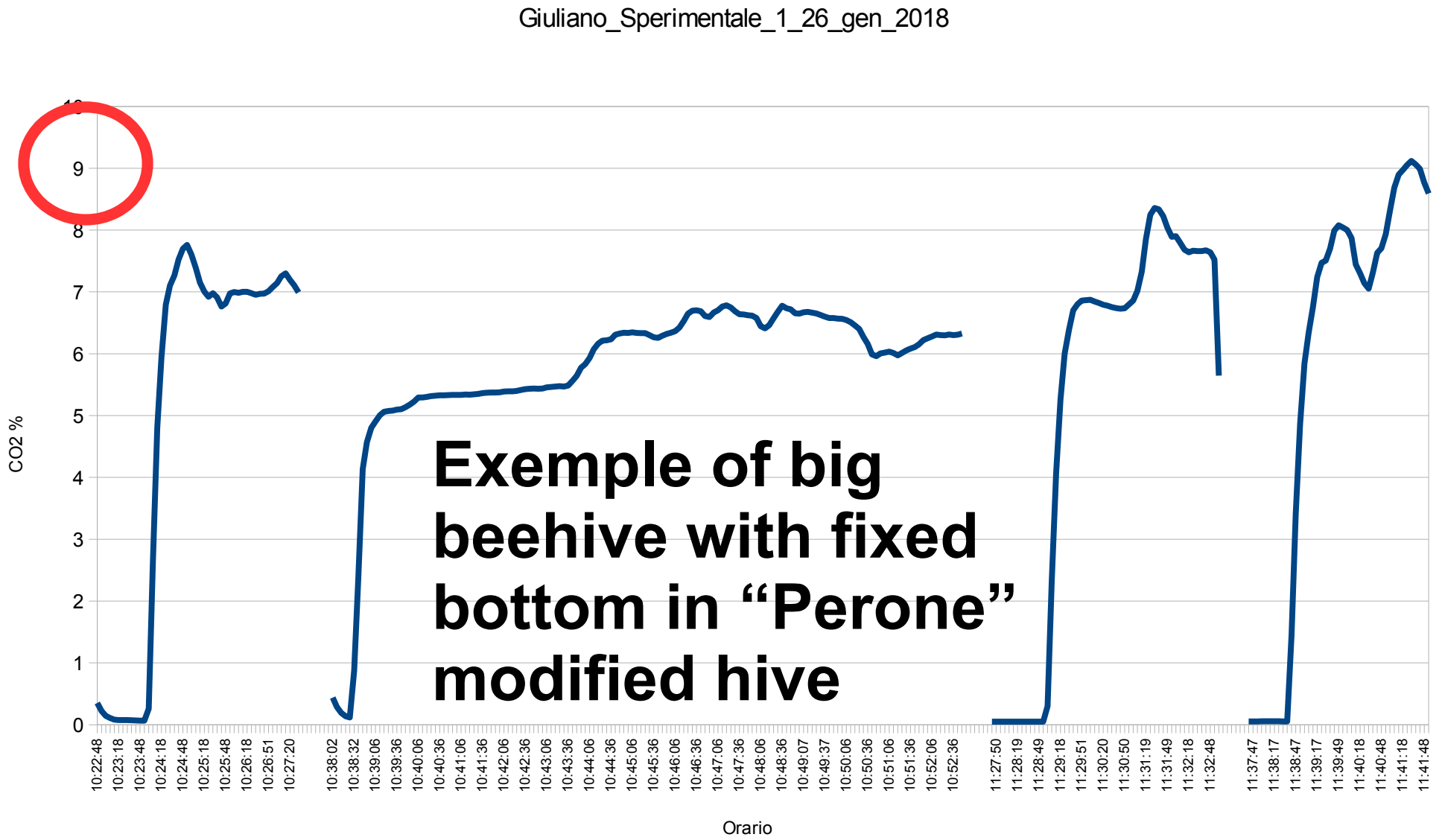


First campaign: winter 2017-2018



Second campaign of measures
Summer 2018

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Classic Dadant-Blatt hives (DB-10)

Second campaign of measures
Summer 2018

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Sun Hive

Second campaign: Summer 2018
Maximum values of CO_2 concentration

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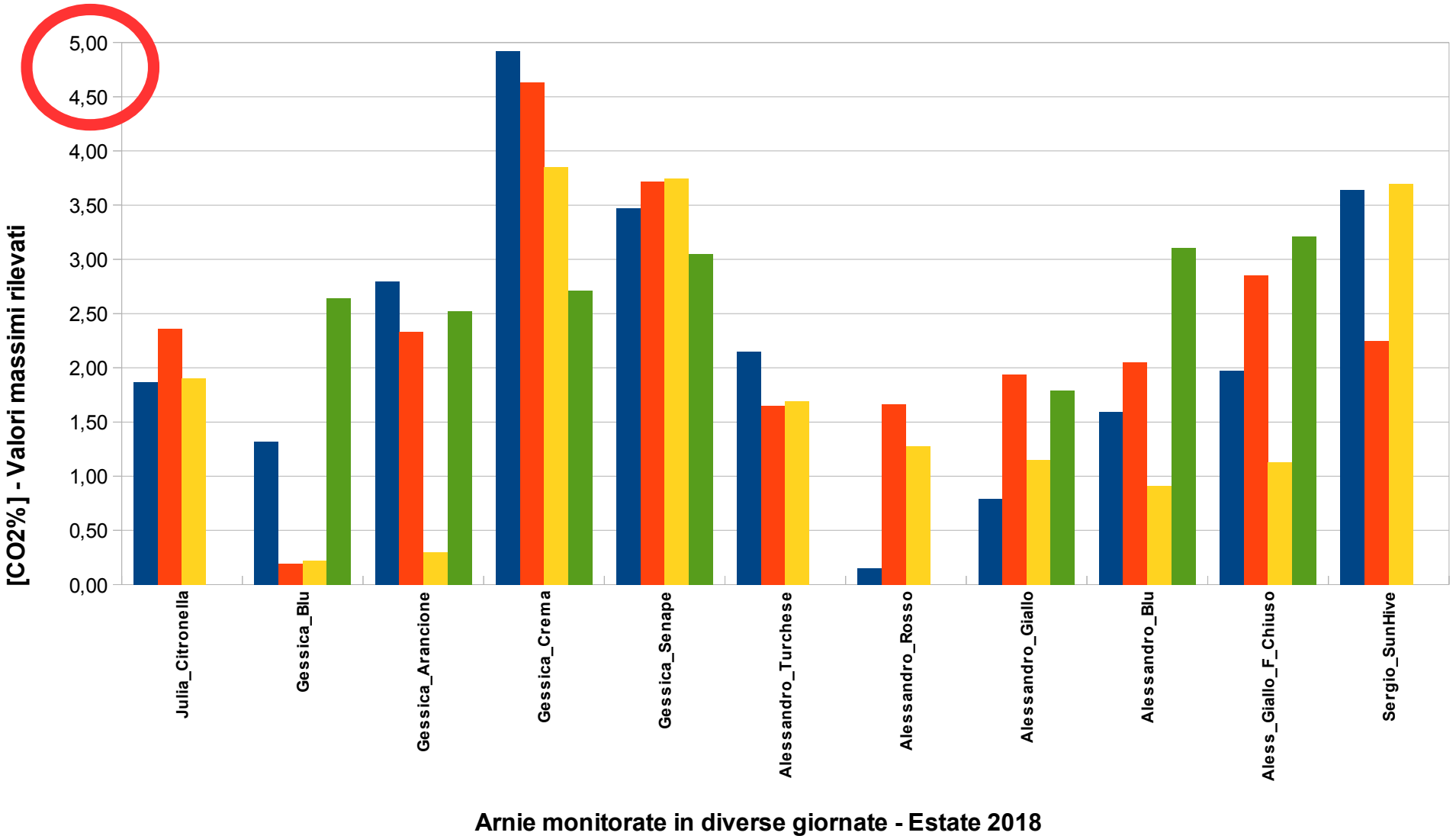

The Final Discussion

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1) Measurements were performed in the open field (nine different apiaries)

2) An extreme sensitivity of the beehives has been detected during measurements

3) The temperatures detected in the central and upper part of the hives have allowed to distinguish the situations with and without brood

4) In hives without a fixed bottom the concentration of CO_2 in the lower part of the beehives settles down quickly on the background values (0.04%)

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5) Populated beehives with closed bottom and small openings in winter can accumulate large concentrations of CO_2 (even over 10%)

6) During the summer there are no maximum CO_2 concentration values above 5% due, among other things, to the great activity of bees (breathing and ventilation)

7) In hive with closed bottom, small openings with vertical structure (like "*Perone*") or rounded shapes (like "*Sun Hive*"), higher values of CO_2 concentration are normally found compared to the classic Dadant Blatt (DB) beehives

Thank You for the Attention

ApiSophia
Sabrina Menestrina – Luca Mion

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SEMINIAMO FIORI PER LE API ITALIANE!

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È IN CORSO UNA IMPORTANTE MORIA DI API PER MOLTEPLICI MOTIVI. QUESTA È UNA SITUAZIONE DI GRANDE PERICOLO MA C'È QUALCOSA CHE POSSIAMO FARE TUTTI CON GRANDE FACILITÀ.

BASTA AVERE UN BALCONE, UN'AIUOLA, UN PEZZETTO DI TERRA O UN VASO FIORITO CHE PERMETTERANNO ALLE NOSTRE API DI SOPRAVVIVERE. PERCHÉ LE API SONO AFFAMATE A CAUSA DELLE MONOCOLTURE E DI CONDIZIONI CLIMATICHE ESTREME!

TROVATE DI SEGUITO INDICAZIONI SULLE SPECIE CHE LE API PREDILIGONO LE CUI PIANTINE E SEMENTI SONO REPERIBILI NEI CONSORZI AGRARI, NEI NEGOZI DI SETTORE, NEI VIVAI E NELLE NUMEROSISSIME MOSTRE DI PIANTE RARE E ORTICOLE CHE ORNANO DI COLORE, BELLEZZA E DELICATEZZA LA PRIMAVERA ITALIANA, IN CITTÀ, IN VILLE, PARCHI E CASTELLI. **PASSIAMO PAROLA!**

PIANTE ORNAMENTALI:

Achillea, Alcea rosea, Bocca di leone, Borragine, Calendula, Campanula, Fiordaliso, Centauree perenni, Valeriana rossa, Cosmea, Dalia, Garofano dei poeti, Echinacea, Erica, Papavero della California, Fragola, Edera, Iperico, Lavanda, Margherita, Malva, Camomilla, Nepeta, Nigella, Papavero, Scabiosa o vedovina, Sedum, Tagete, Tarassaco, ...

PIANTE AGRARIE:

Grano saraceno, Sulla, Girasole, Ginestrino, Erba medica, Alfalfa, Lupinella, Facelia, Senape, Trifoglio, Veccia, ...

PIANTE AROMATICHE:

Aglio, Cipolla, Coriandolo, Finocchietto selvatico, Elicriso, Liquirizia, Issopo, Menta, Maggiorana, Origano, Rosmarino, Salvia, Santoreggia montana, Timo, ...

IN COLLABORAZIONE CON:

LEGAMBIENTE Circolo di Udine

Associazione per l'Agricoltura Biodinamica *Sezione Friuli*

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