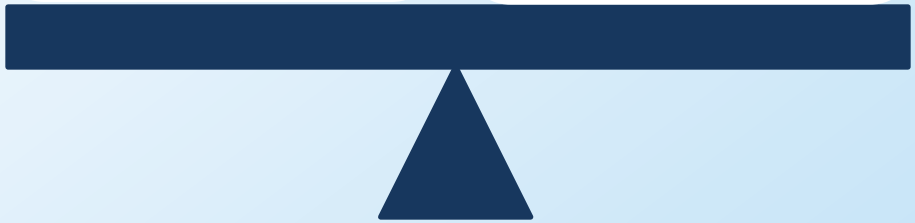
TPMS

OICA POSITION

Situation inside UNECE 1958 agreement

"Harmonisation approach"	"European approach"
Paves the way to a gtr thanks to US/EU experience	Amending FMVSS in order to:
Fast application of FMVSS138 requirements	Improve **fuel efficiency**, and Accelerate **deflation detection**



Political decision to be taken by the 1958 Contracting Parties

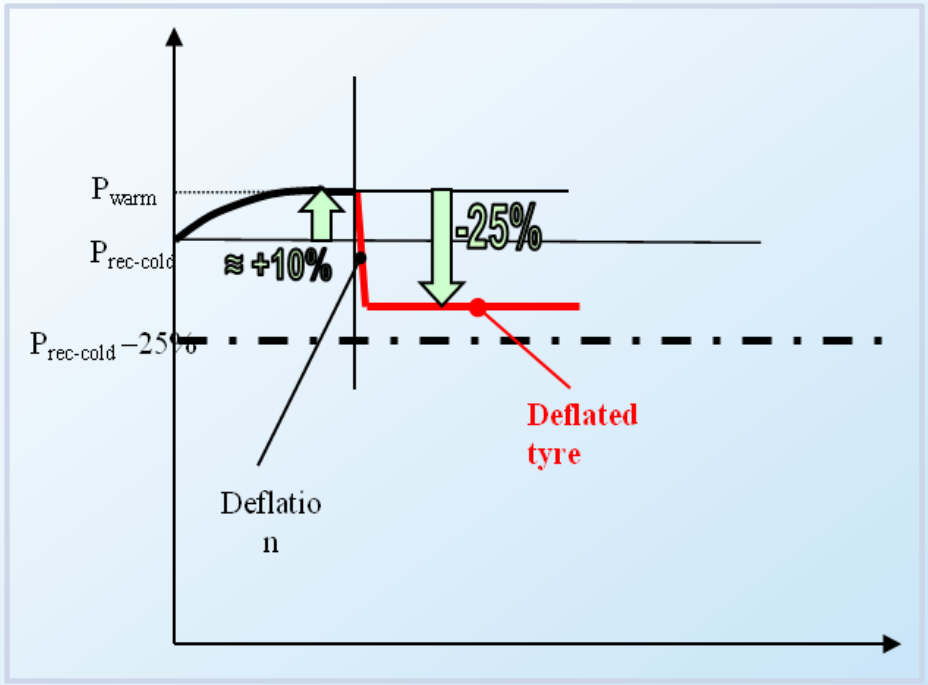
OICA can support "Harmonisation approach"

"European approach" needs some compromise inside GRRF-TPM-WG

Current consensus at GRRF-TPM-WG

New test procedure

Separate CO_2 vs Safety



CO_2 - slow process

Safety – fast detection

Current divergences at GRRF-TPM-WG

CO_2 - slow process:

- Threshold TBD
- Warning within [30-60] minutes after pressure loss
- Warning for any combination of wheels with pressure loss
- Test speed: TBD

Safety - fast detection:

- P_{warm} – 25 % OR P_{warm} < 150 kPa (whatever is higher)
- Warning within 10 minutes after pressure loss
- Warning for any 1 wheel out of 4 with pressure loss
- Test speed: TBD

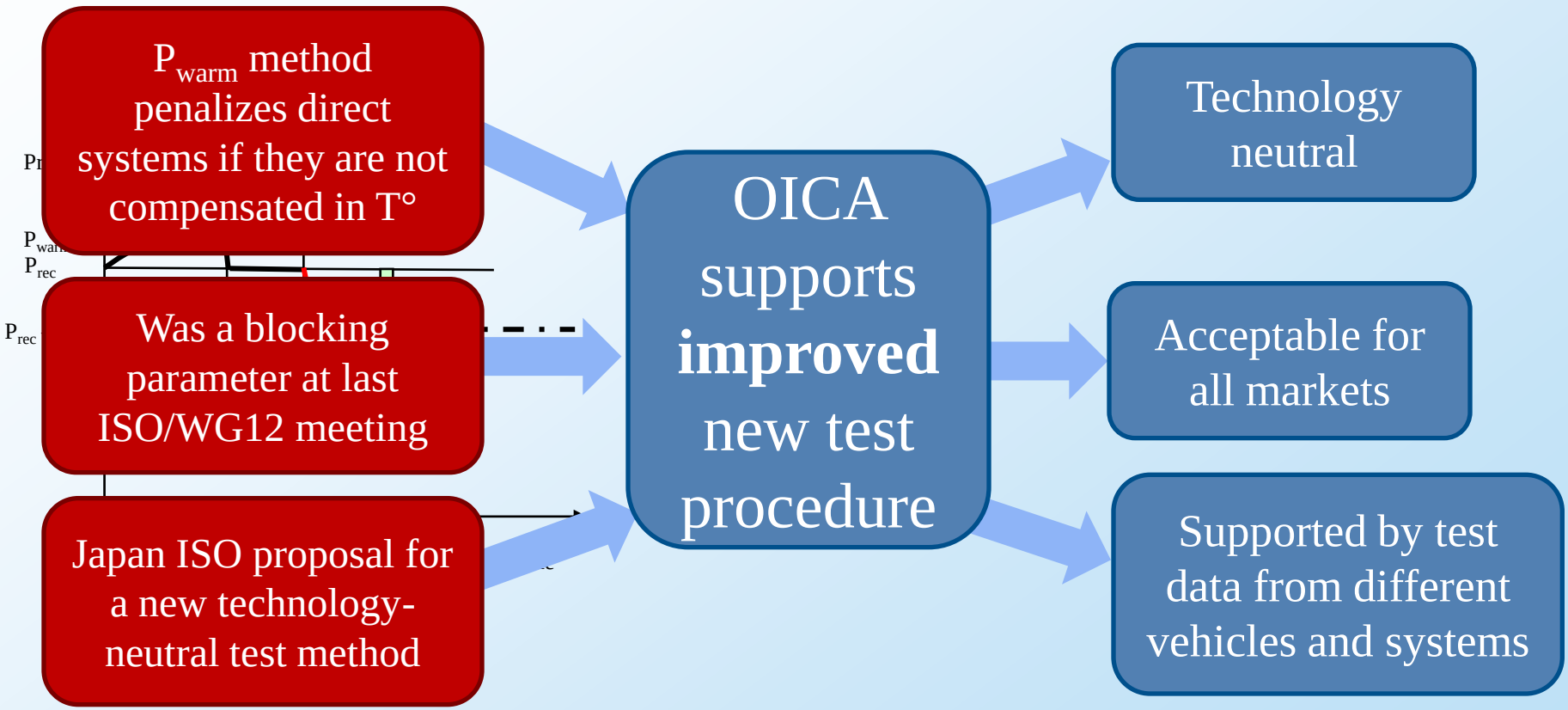
Test speed

- Can TPMS benefits improve by extending the test speed range?
- **No**, because:
  - Performing high speed tests > 130 km/h
    - would become difficult on open roads
    - would become unsafe (as a comparison, ESC testing is performed at 80 km/h)
  - Performing low speed tests < 40 km/h
    - is not a safety issue
    - would exclude certain technologies

OICA supports test speed for **CO_2 warning: 40-80km/h**

OICA supports test speed for **safety warning: 90-130km/h**

OICA position on test procedure



Details of new Japan ISO test procedure

Advantages:

1. Technology neutral (direct vs indirect)
2. Supported by existing data (see annex)
3. Good repeatability => eradicates influence of parasite factors (external temperature, weather, driving speed, tyre warm-up)
4. Fits all market conditions

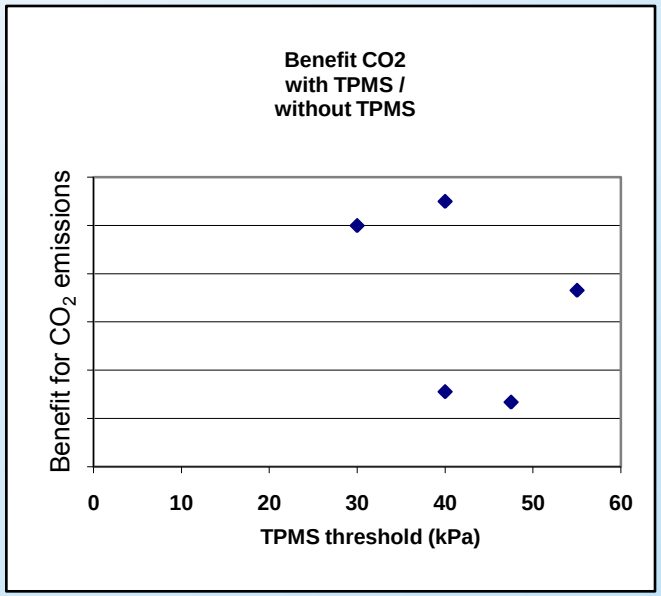
Drawback:

"Laboratory" test i.e. does not exactly represent real world

=> but is there any other practical test procedure representing a real world air diffusion over months?

Threshold for CO_2

- Can more severe thresholds improve TPMS CO_2 efficiency?
- **No**, because:
  - Efficiency does not depend ONLY on threshold
  - P_{rec} - 25% is a well recognised value
  - Tighter thresholds would not automatically improve CO_2 efficiency



OICA supports CO_2 warning at Prec -25%

Time to warning for CO_2

- Can shorter alert delays improve TPMS CO_2 efficiency?
- No, because:
  - Deflation by "normal permeation" is a process of months
  - Test with 60 minutes “cumulative driving time” allows that the engine may be stopped and restarted during the test
  - Shortening the alarm delay to less than 60 minutes would discriminate some technologies without noticeable CO_2 benefits

OICA supports CO_2 warning within 60 minutes cumulative driving time

Tyre Industry: Legal concern

A TPMS regulation defines **no requirement on tyres**, but only **vehicle** performance requirements

The component "tyre" is approved with regard load/speed-performance (R30 and 54).
The component "tyre" is sold without pressure

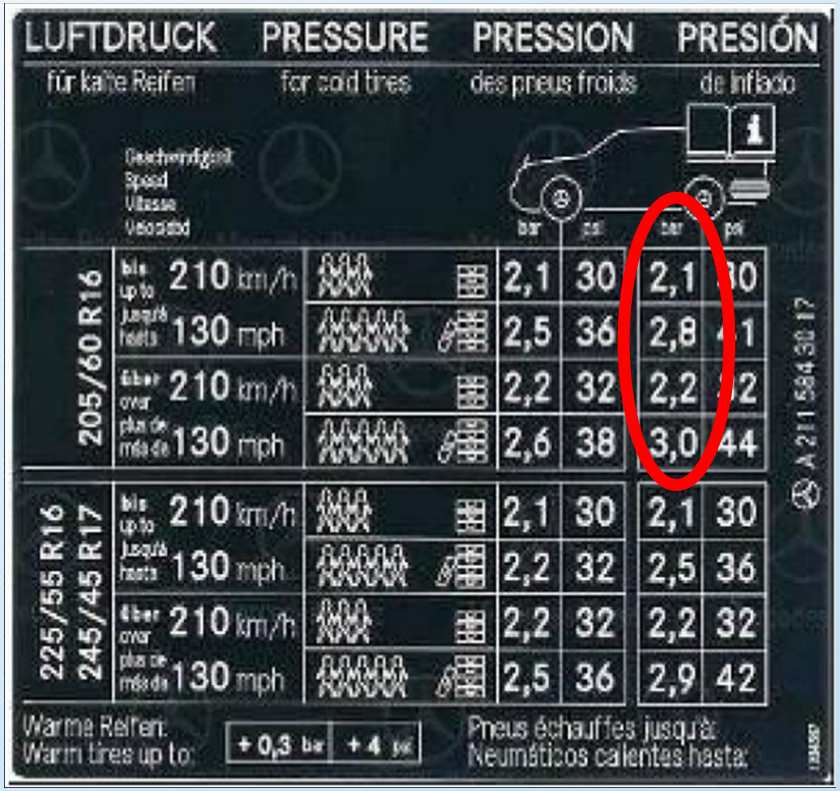
The driver is responsible for the correct maintenance of its tyres.
Field data shows that drivers with TPMS are generally more sensitive to tyre pressure.

Vehicles should NOT be more heavily regulated only to protect the tyre Industry!

In addition: Over-inflation may improve tyre integrity but also leads to braking and vehicle handling **deterioration**!

Relationship TPMS v/s Tyres

- Example of the recommended cold tyre inflation pressure:
  - A tyre is able to be safely operated in different load/speed/pressure conditions.
  - In practice, a tyre is rarely operated under optimum pressure conditions.
  - A too tight alert threshold will decrease the system's credibility.



Question :

With a pressure range between 2.1 and 3.0 bar (which is physically justified) will the driver understand an alert at 0.2 bar under the cold or 0.4 bar under the warm recommended pressure?

Conclusion: no need for an additional requirement if CO_2 (slow process) and safety (fast detection) are already covered.

Conclusions

GRRF-TPM work almost terminated, Industry needs fast technical decision	Need for a political choice between	FMVSS138 OR improved new test procedure
Accurate TPMS nonsense w/o adapted infrastructure	Pressure gauge accuracy and introduction campaign	Regulate pressure gauge accuracy and organize introduction campaign
TPMS will be regulated at UNECE level	Not all markets can afford expensive equipment	TPRS present as an option in UNECE Regulation
Air permeation is main cause of pressure leakage hence CO_2 emissions	Attack the fire at its root	Regulate maximum air permeation rate

OICA position for TPMS requirements

- OICA can support "Harmonisation approach", i.e. FMVSS138 test procedure and performances
- If GRRF decides to follow a "European approach", OICA can support improved new test procedure:

CO_2 - slow process:

- P_{rec} – 25 %
- Warning within 60 minutes after pressure loss, cumulative driving time
- Warning for any combination of wheels with pressure loss
- Test speed: 40 to 80 km/h

Safety - fast detection:

- P_{rec} – 25 % OR 150kPa
- Warning within 10 minutes after pressure loss
- Warning for any 1 wheel out of 4 with pressure loss
- Test speed: 90 to 130 km/h

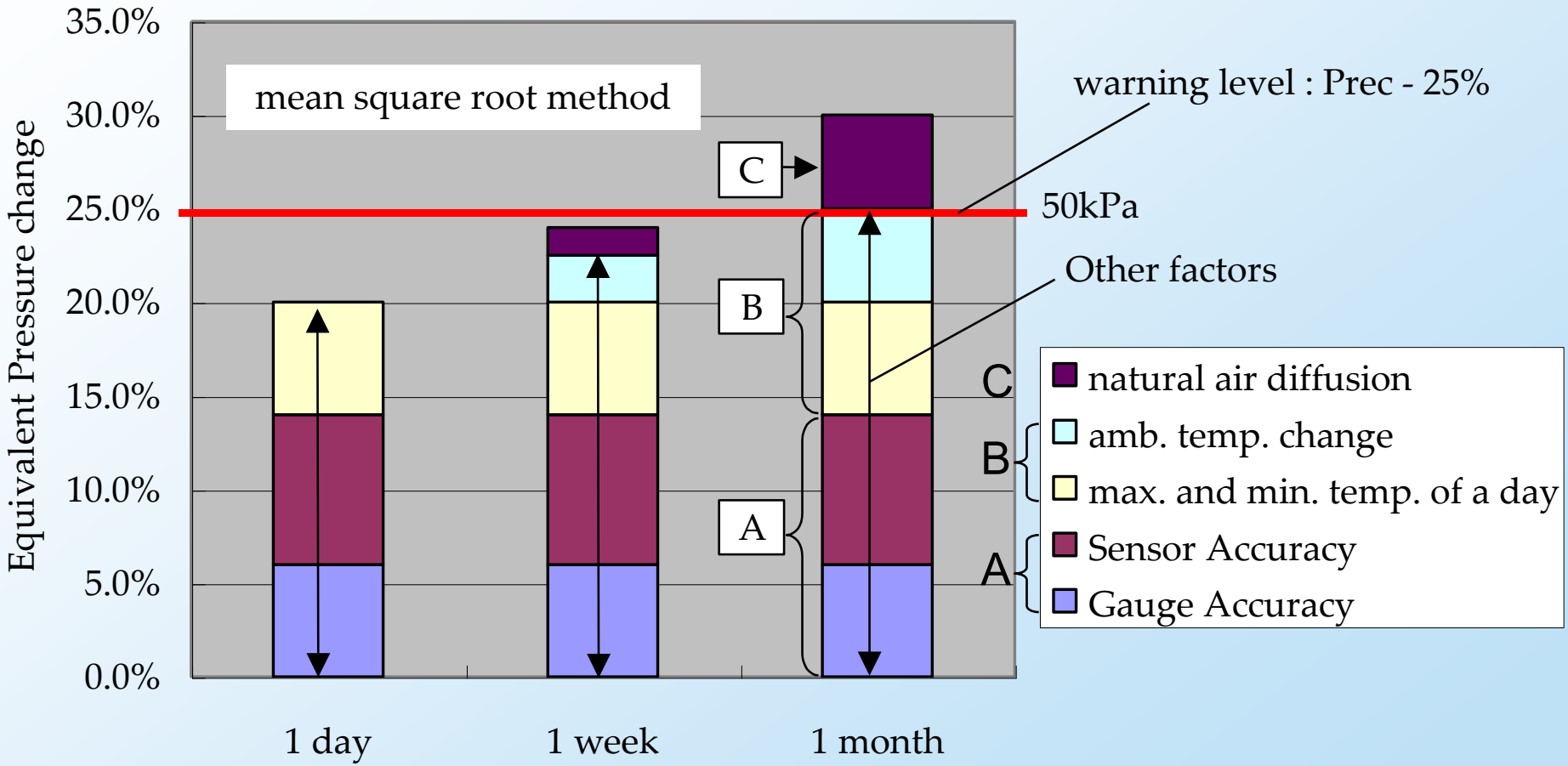
Annex I

Influence factors on
pressure measurement variations

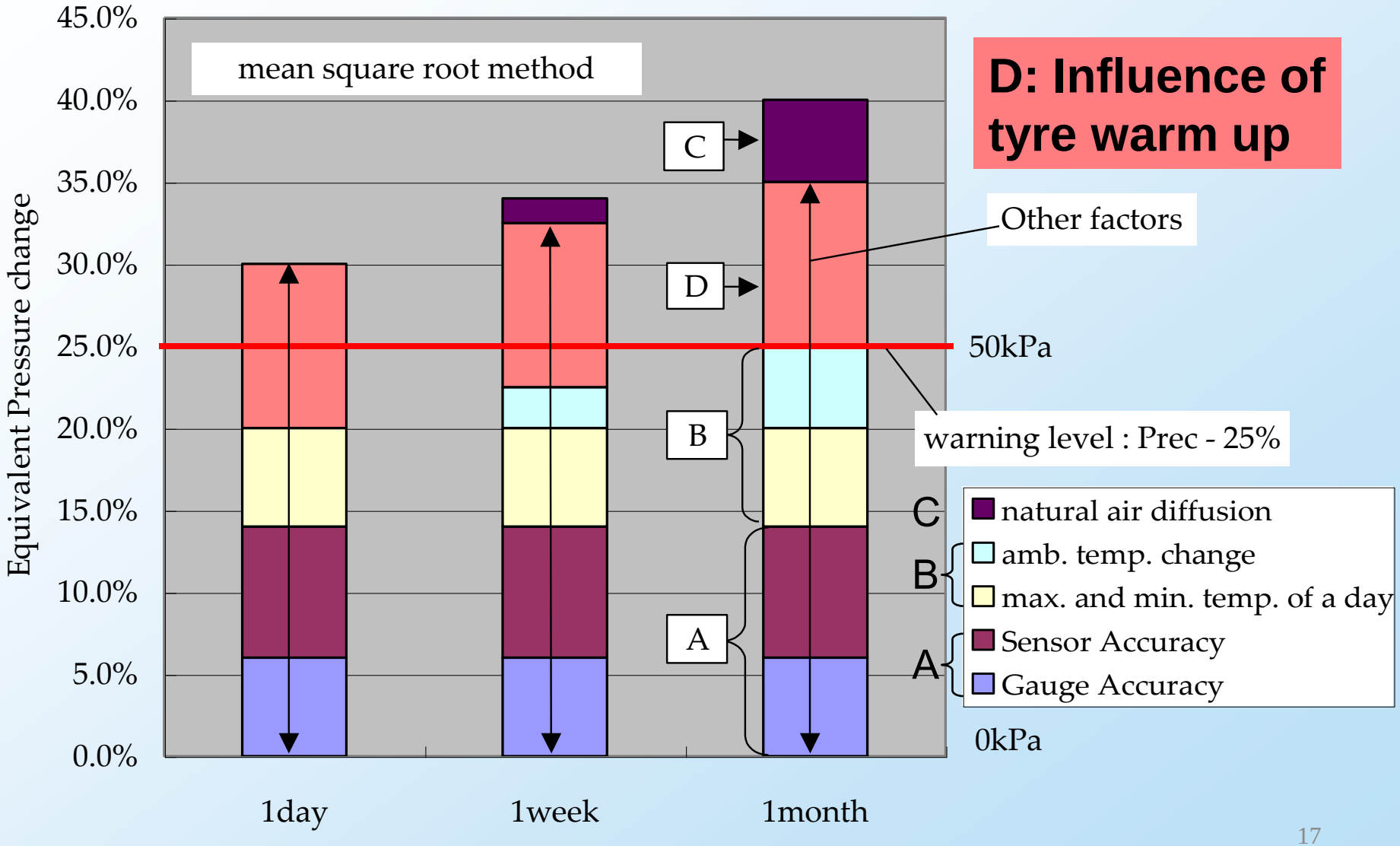
Pressure measurement variations

- Other influence factors than natural air diffusion:
  - Tyre warm up when vehicle is running
  - Tyre cool down due to water/snow (rain, car wash, …)
  - Accuracy of pressure gauges,
  - Accuracy of TPMS sensors,
  - Daily ambient temperature variations,
  - Longer term ambient temperature variations (weeks, months, ...)

Pressure variations for cold tyres



Pressure variations with tyre warm up

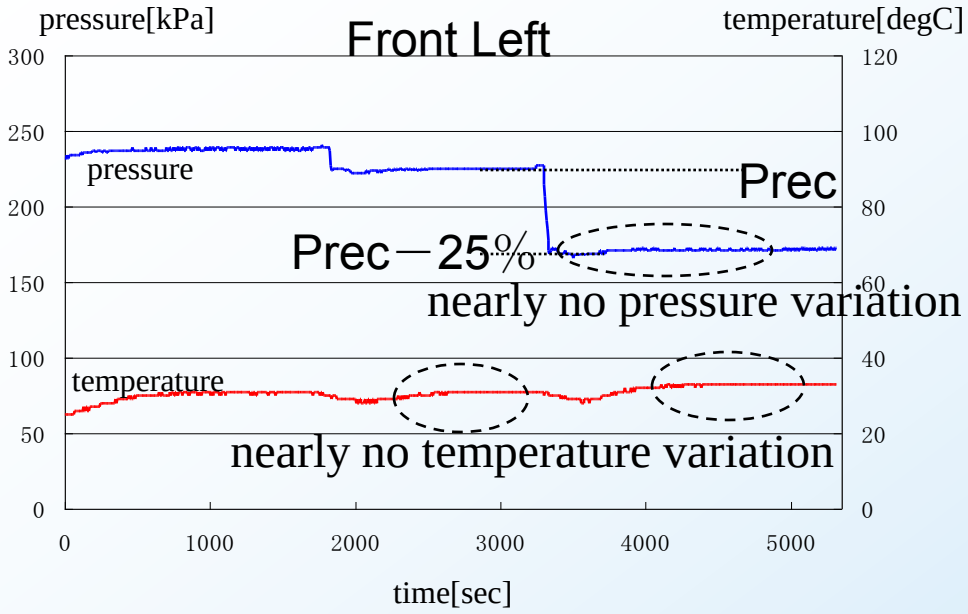


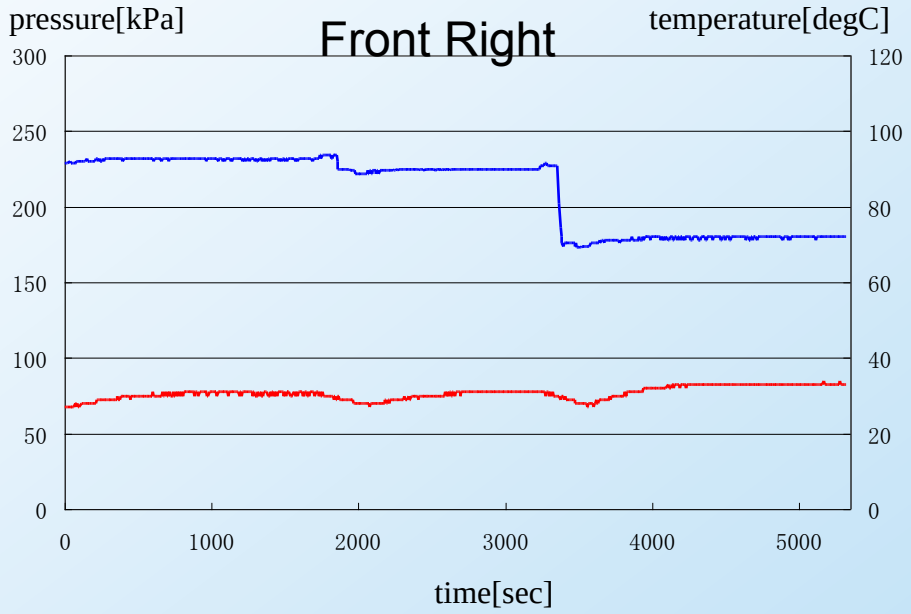
Annex II

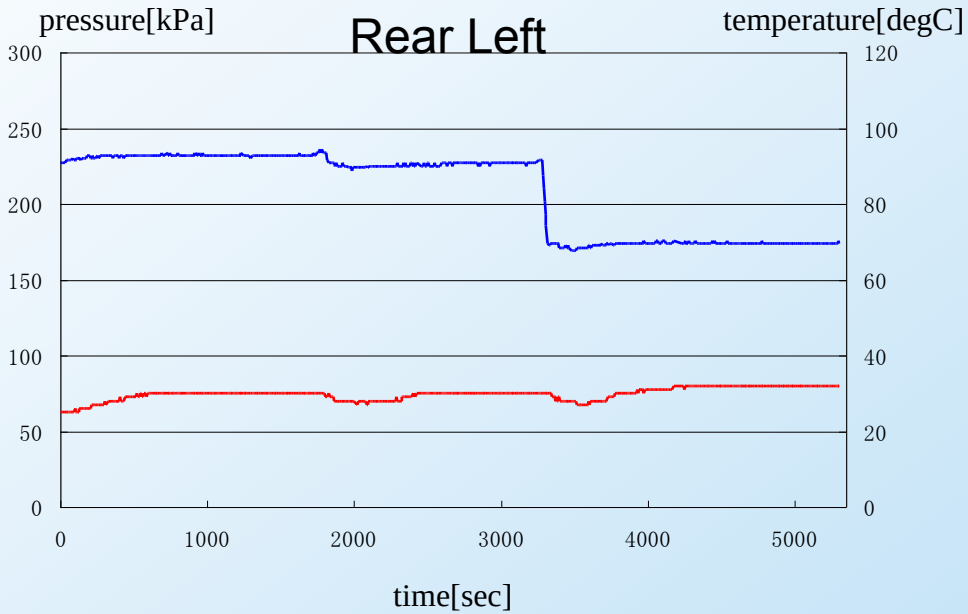
Real world measurements with new test procedure
(Japanese proposal at ISO TC22/WG12)

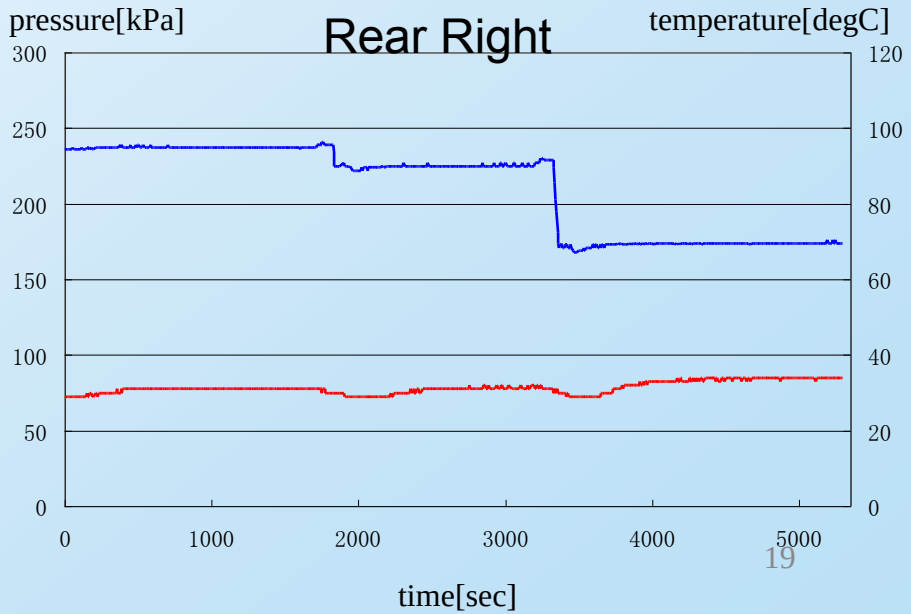
Example: Improved "New Test Procedure"

TPM-04-03
Vehicle Speed＝130km/h









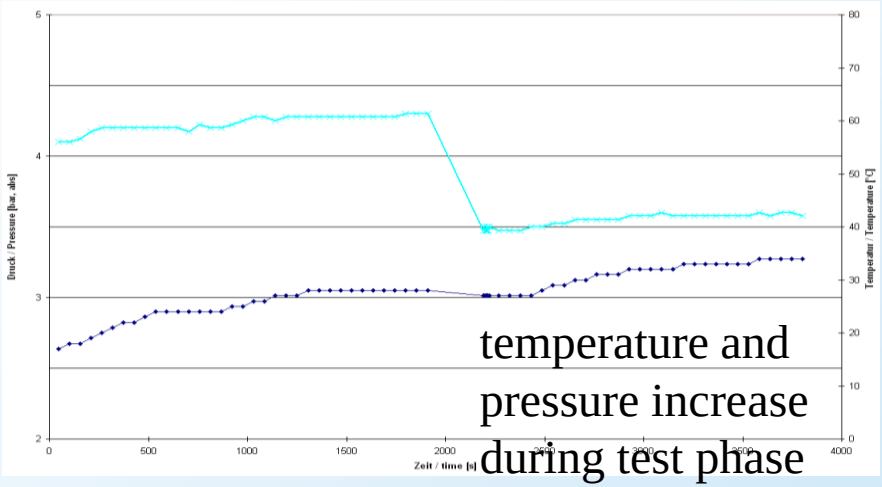
Vehicle Speed＝50-100 km/h

Example: Current “New Test Procedure”

Front left

P [bar] (absolute)

T_{tyre} [C]



temperature and pressure increase during test phase

Front right

P [bar] (absolute)

T_{tyre} [C]