


SELECTING OPTIMAL GRADIENT FACTORS FOR USE BY BELGIAN MILITARY DIVERS

MORE CONSERVATIVE SETTINGS ARE NOT NECESSARILY SAFER

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Selecting optimal Gradient Factors for use by Belgian military divers: more conservative settings are not necessarily safer


What is the issue?

Shearwater Perdix - default gradient factors (30/70) are too restrictive:

- Shorter usable work time under water
- Introduction of mandatory deco-stops

⇒ *Belgian Navy divers asked us to have a closer look at the dive computer algorithm and gradient factors settings*

- ⇒ Recommendations to increase usable work time under water while maintaining safety
- ⇒ Guidelines for gradient factor settings



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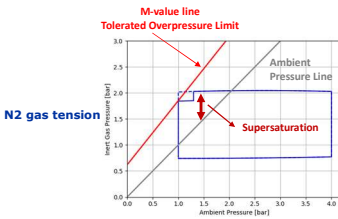
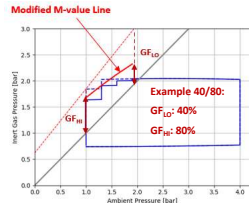
BÜHLMANN ZHL-16C AND GRADIENT FACTORS

Bühlmann ZH-L16C
 16 parallel compartments, each having its own:


- theoretical half-time
- tolerated overpressure limit

Gradient Factors (GF)

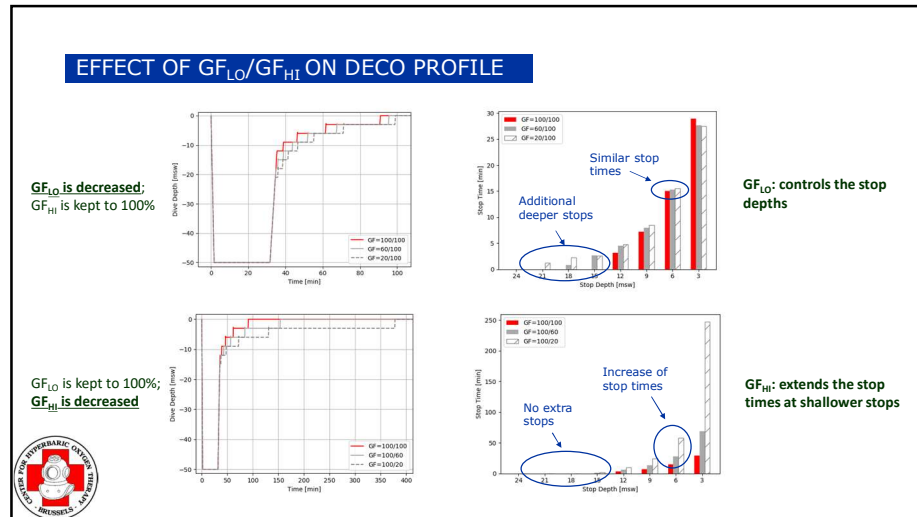
- GF_{LO} / GF_{HI}
- GF: fraction of the difference between P_{amb} and M-line (100% is the original M-line)
- **Convention:** $GF_{LO} \leq GF_{HI}$

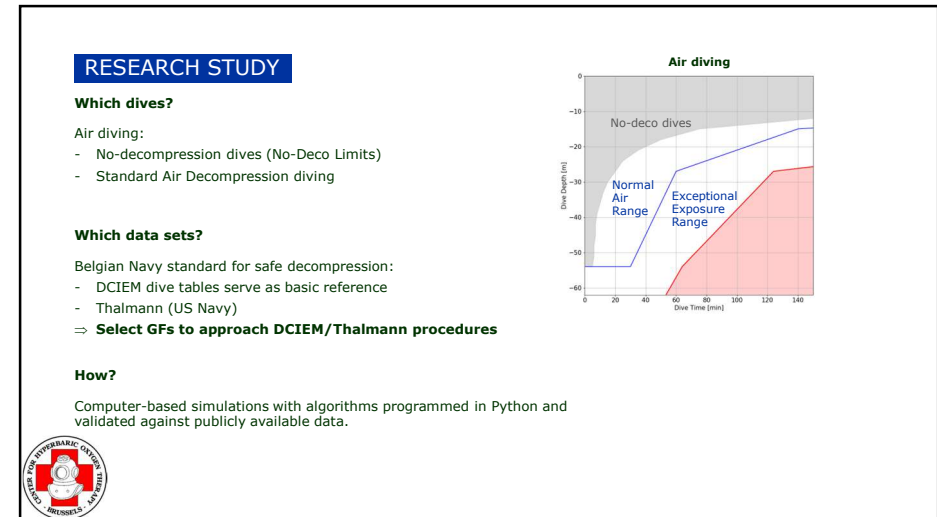
Gradient Factors modify validated decompression profiles and the validated Bühlmann ZH-L16 model by changing the original M-value lines.



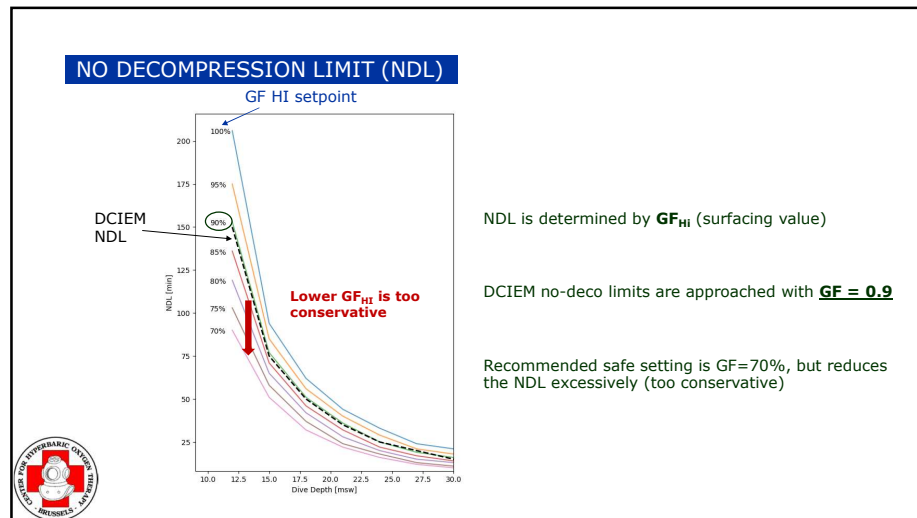
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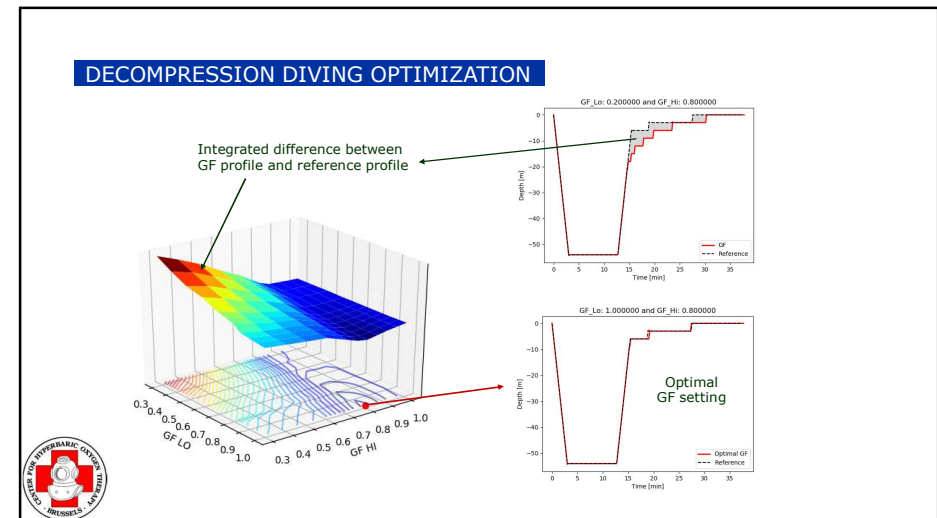
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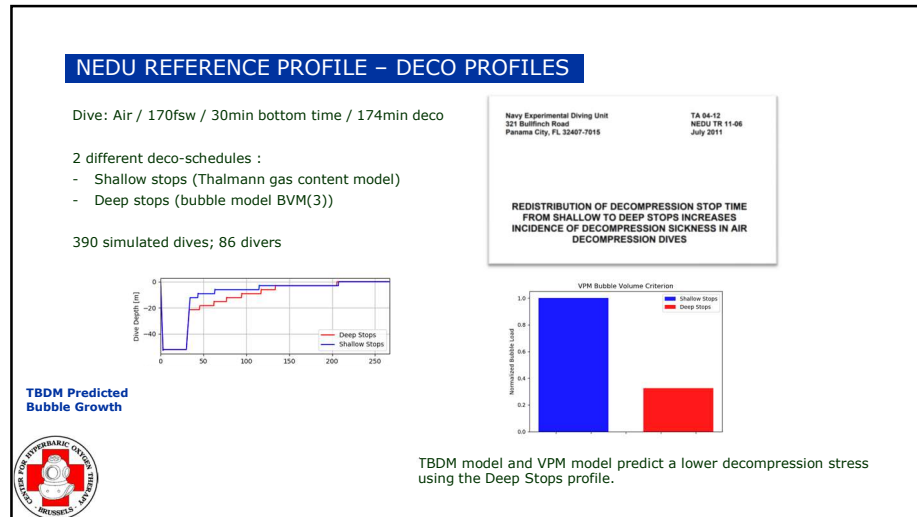
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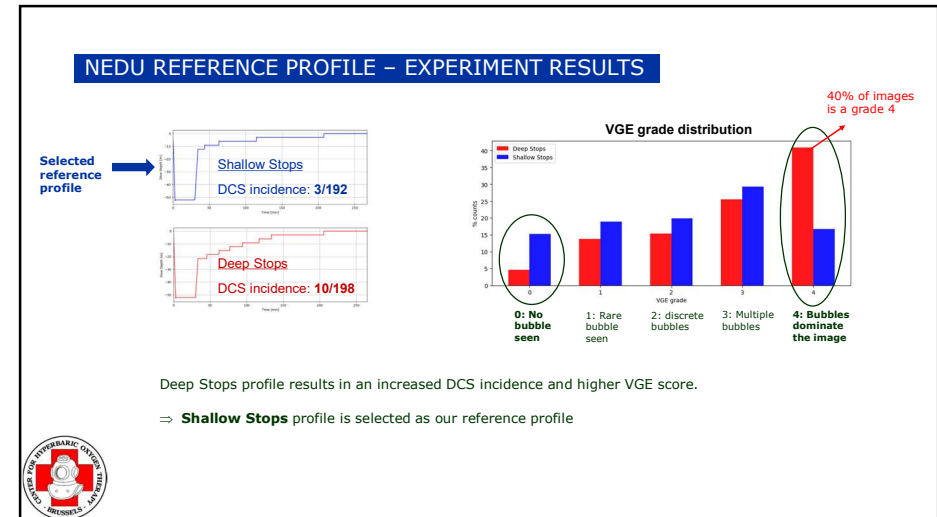
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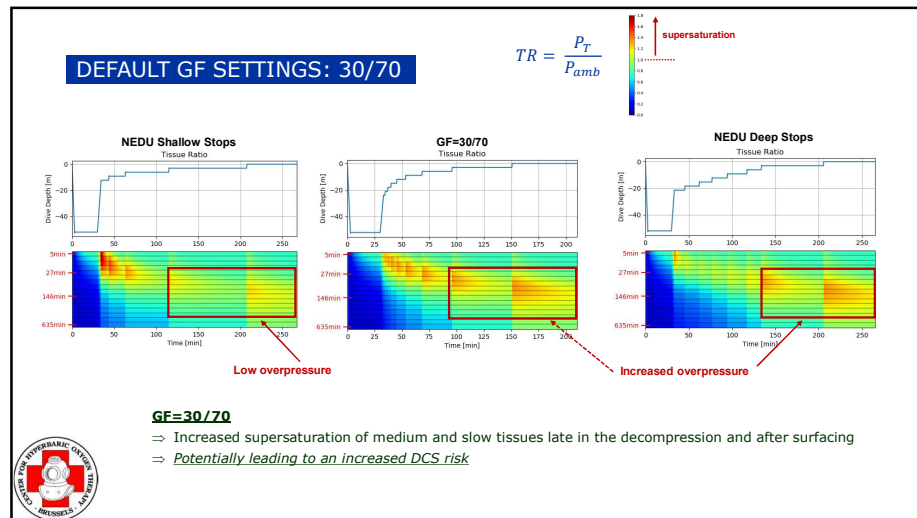
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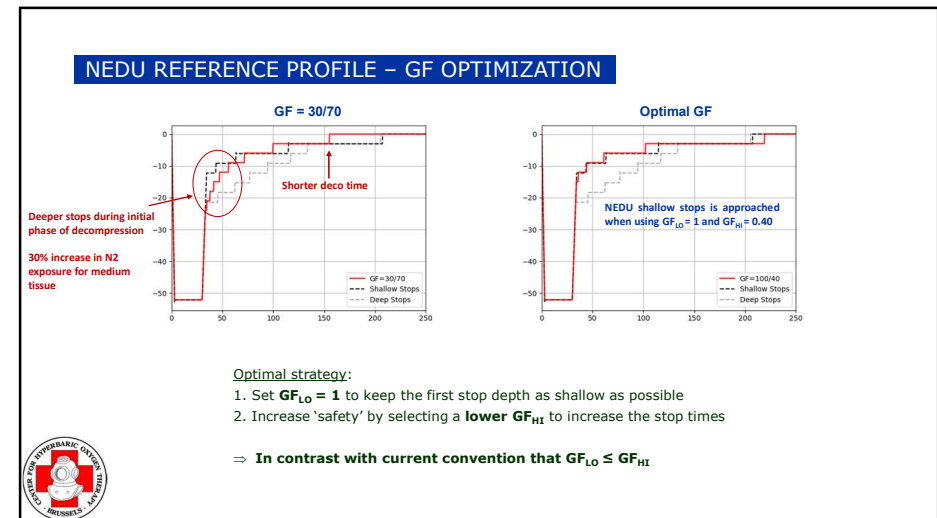
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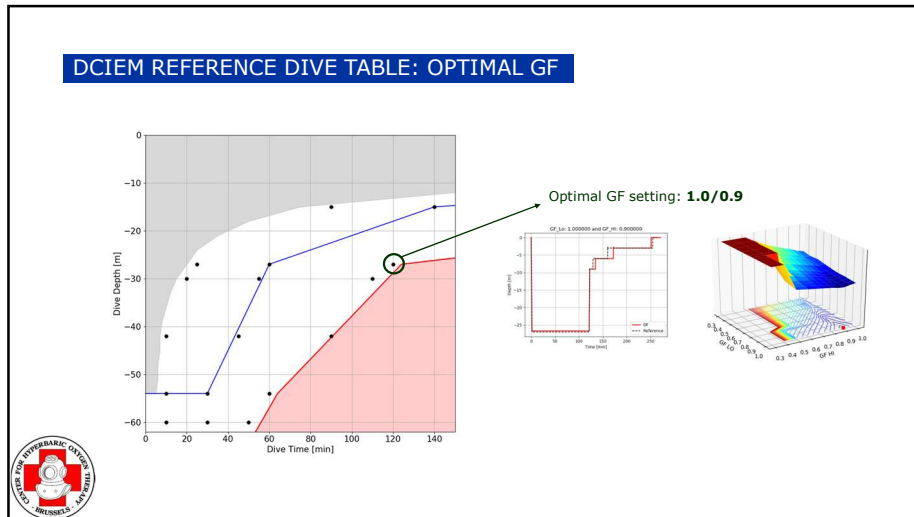
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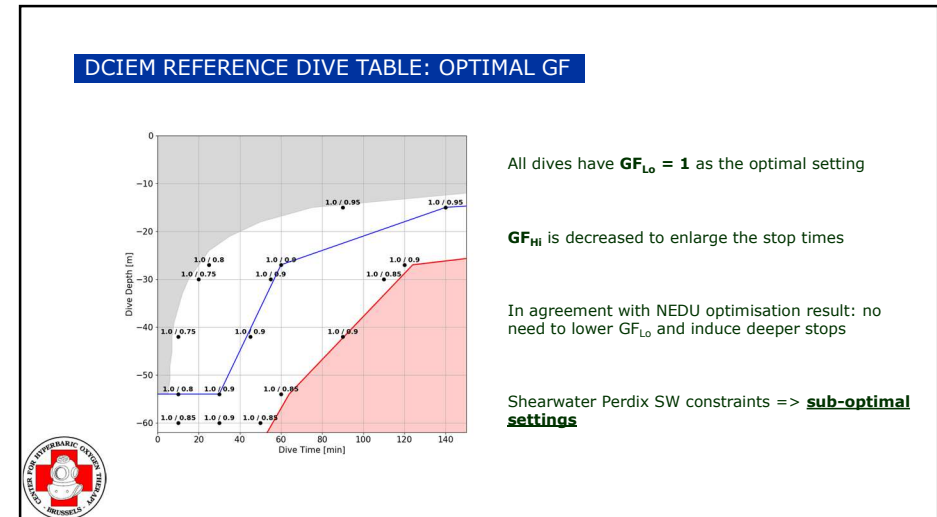
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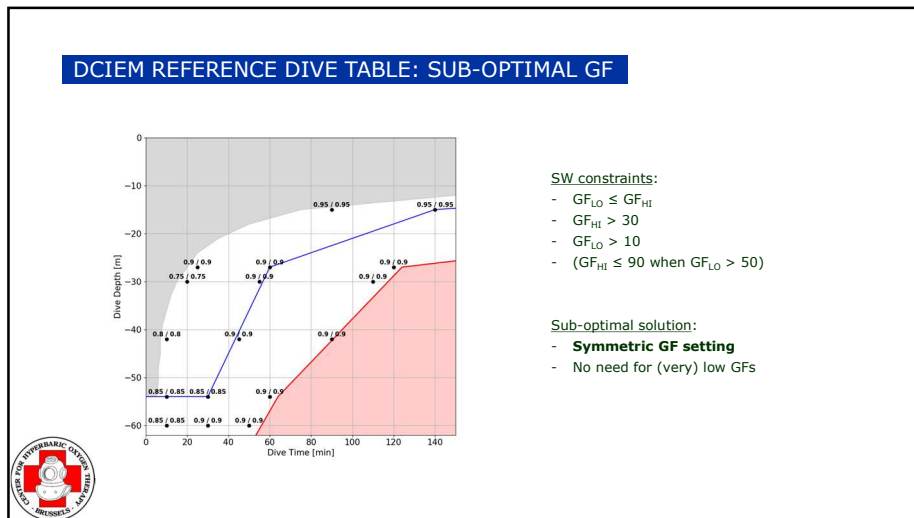
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CONCLUSIONS

1. Think of Gradient Factors as 'parameters to change the profile', rather than in terms of 'conservatism'
 2. No-decompression dives: DCIEM NDL are approached with $GF_{HI} = 90\%$
 3. Decompression diving: there is no scientific evidence that the default 30/70 (GF_{Lo}/ GF_{HI}) setting leads to a more 'conservative' or safer decompression profile
 - Optimal GF setting: $GF_{Lo} = 100\%$ and decrease GF_{HI}
 - Current software restriction do not allow these optimal settings, therefore use symmetrical GF settings, e.g. 90/90, 80/80, etc.
- ⇒ *Belgian Navy divers have been advised to refrain from using the default settings of the Shearwater Perdix and instead adopted the symmetric GF setting approach.*



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