

Water Temperatures for Matched Cold Exposures in Divers With or Without Wet Suits During Air Decompression Dives

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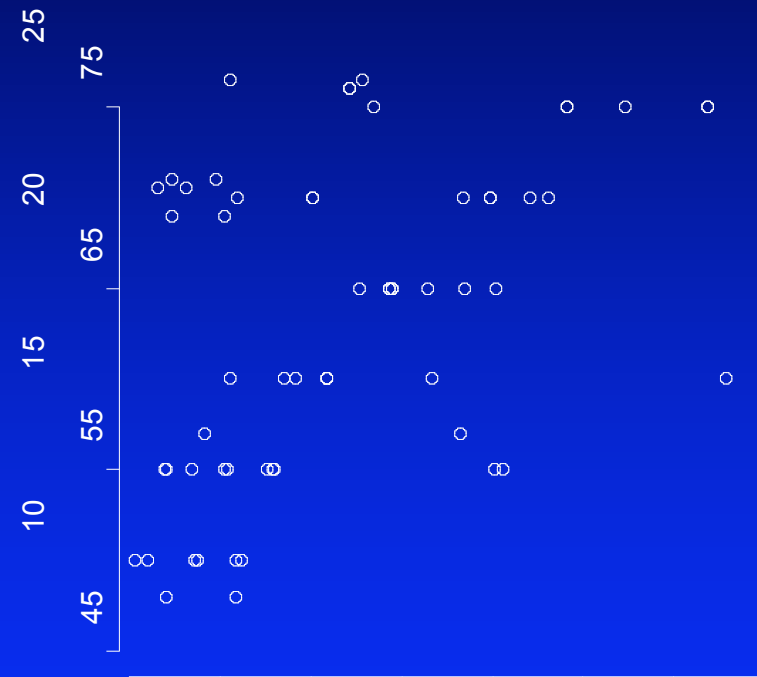
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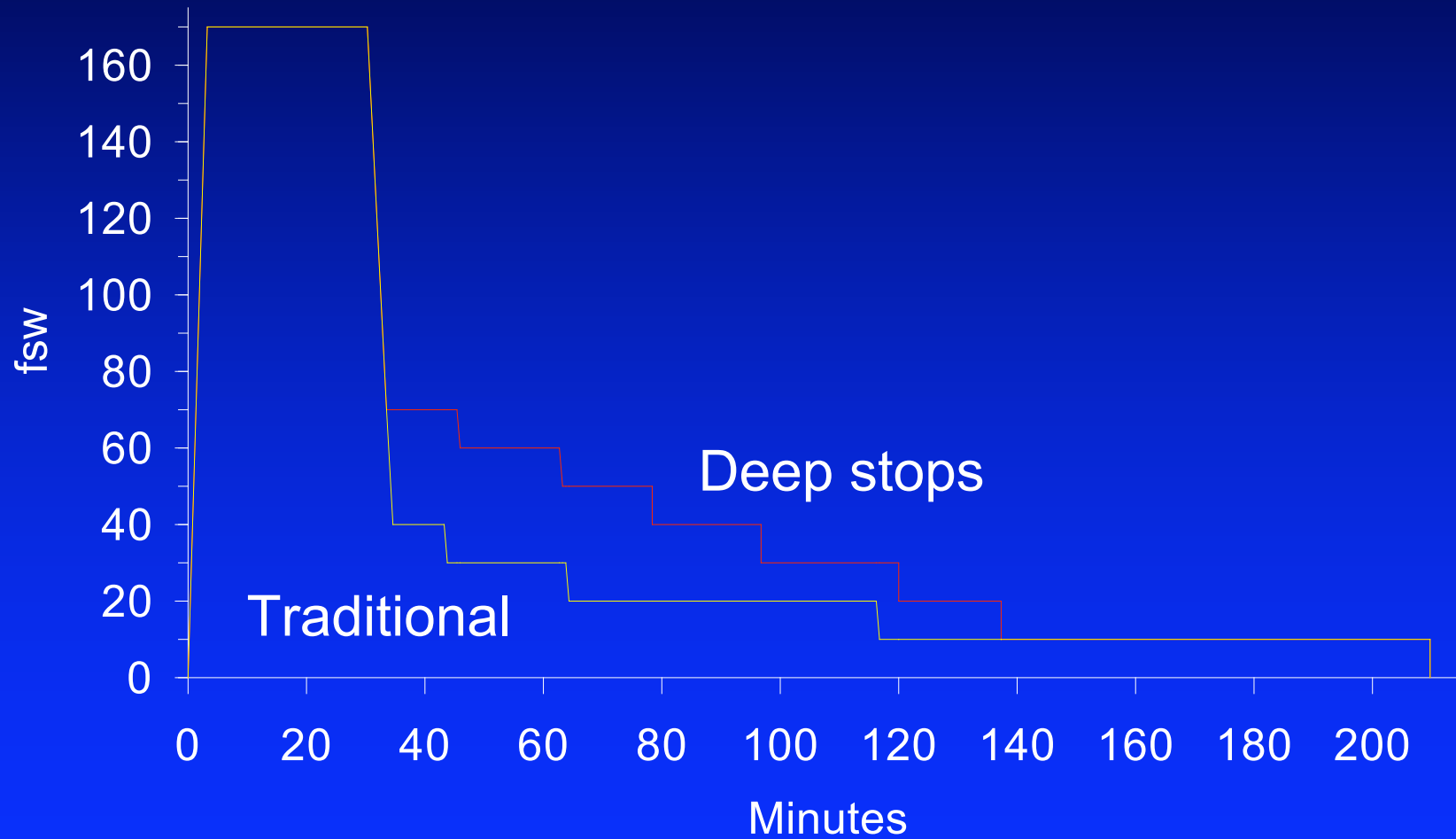
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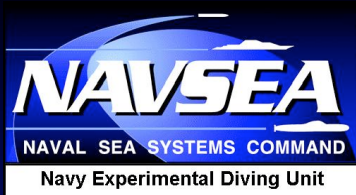
Introduction

- USN N₂-O₂ primary data set dives mostly:
 - Cold water immersed
 - Wet suits
 - Working
- Used to calibrate decompression models
- Diver thermal status is an important determinant of DCS risk
- Diver thermal status rarely quantified



Motivation





Methods 1:

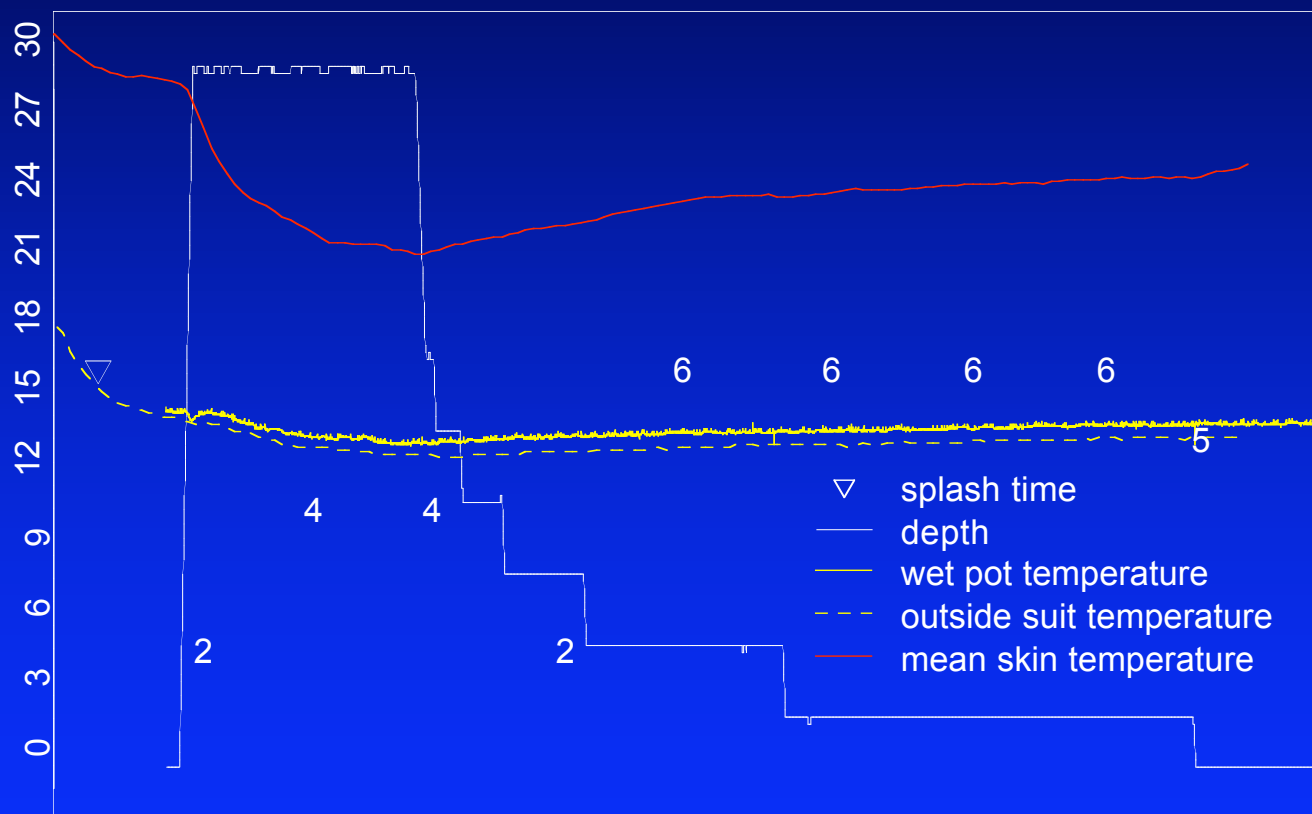
Replicate “typical” USN N₂-O₂ primary data set dive

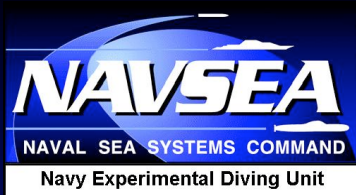
- 12 divers
- 5-7 mm wet suits
- 60 °F (16 °C) water temperature
- Breathing surface-supplied air via full face masks
- 129 minute, 100 fsw air decompression dive
- Intermittent 125 watt cycle ergometer work on bottom
- Rest during decompression
- Skin temperature
- Subjective thermal status scores



Figure 1 is a line graph showing the time course of physiological and behavioral data during a simulated escape from a burning boat. The Y-axis represents time in minutes (0 to 100). The X-axis represents time in minutes (0 to 100). The graph displays four data series: splash time (marked by a downward triangle), depth (solid black line), wet pot temperature (dashed black line), and outside suit temperature (solid red line). The depth starts at 0, rises to 100 at approximately 10 minutes, and then drops to 0 at approximately 100 minutes. The wet pot temperature starts at approximately 60, drops to approximately 55 at 10 minutes, and then rises to approximately 58 at 100 minutes. The outside suit temperature starts at approximately 60, drops to approximately 55 at 10 minutes, and then rises to approximately 58 at 100 minutes. The splash time is marked by a downward triangle at approximately 10 minutes. The graph is divided into five numbered regions (1 to 5) by vertical lines.

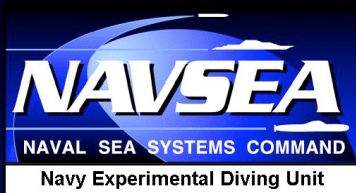
Results 1

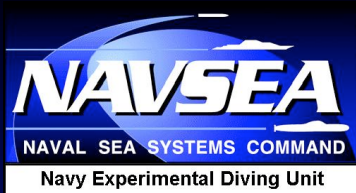




Methods 2 : Simulated decompression dive wearing shorts & t-shirts

- 11 of same divers
- Cotton shorts & t-shirts
- Water temperature 85 °F (29 °C). Selection guided by mean skin temperature
- 3 fsw dive
- 115 watt cycle ergometer work for 26 minutes
- Rest during 3 minute “descent” and 181 minutes “decompression”
- Subjective thermal status scores

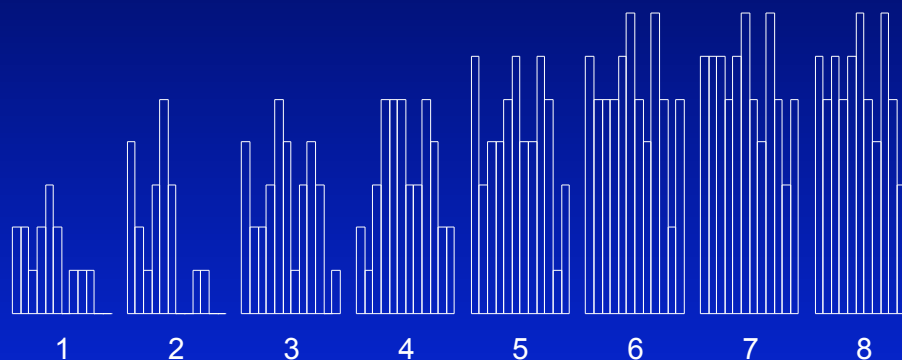




Results: Thermal Status Scores

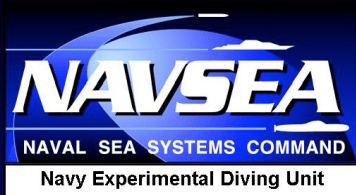
7
6
5
4
3
2
1
0

60 °F (16 °C), wet suit



Time (15 minute intervals)

7
6
5
4
3
2
1
0



Conclusions

- During prolonged decompression dives, cold stress for divers without wet suits in 85 °F (29 °C) water is similar to that for divers wearing wet suits in 60 °F (16 °C) water