

# Maraging Steel - SUS perspective for round-table discussions

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# Outline

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- Data sources
- Properties
- Treatment
- Unknowns



# Data sources

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- Papers (mostly from VIRGO group) listed in T040083
- Direct input
  - Mike Plissi talked to VIRGO see T040108;
  - Riccardo at SUS meeting see SUS meeting notes
- Simple test at RAL
  - Specimens cut from “near surface” and “near middle” of plate
  - Standard dog-bone specimens
  - failed to give E (T040116 gives the results but not the realisation that they were flawed)
  - gave strength ~1.9 Gpa
- Test of drum-ended wire by Calum
  - Only a single test so far, but
  - 1.4 GPa failure load - did not fail at the junction with the drum-end



# Properties

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- C250 Maraging
- Modulus
  - Used 186 GPa and  $\alpha = 1.36$  for the CP (T040153)
  - Deflections were off by a few % but not consistently, so these values are about right for “generic” use
  - Can now tailor for each blade size (modulo comments to be got from Mike Plissi)
- Strength
  - Around 1.9 GPa yield for plate, ?? For rod/wire
- Creak resistance
  - Assumed OK if we keep the stress below 1 Gpa (55% of yield) and do “anti-creep” heat treatment (see below)
- Damping
  - Assume  $Q = 10^4$



# Treatment

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- Detailed in T040108
- Propose
  - Use C250 grade
    - this is one that was used most by VIRGO and so is best characterised
    - Less difficult to obtain than other grades?
  - Consider buying a single batch for all AdLIGO blades
  - Aged at 435 for 100 hours (cost implications - is this necessary?)
  - Anti-creak treatment under load at 100C for 1 week
    - But does that mean all the blade qualification measurements would have to be done again?
  - Bake-out should be OK following treatment above ??
    - E990022-A calls for 200C for SS and 120C for aluminium, so maybe our anti-creak should be done warmer.
    - And note more recent results from Riccardo and his student.



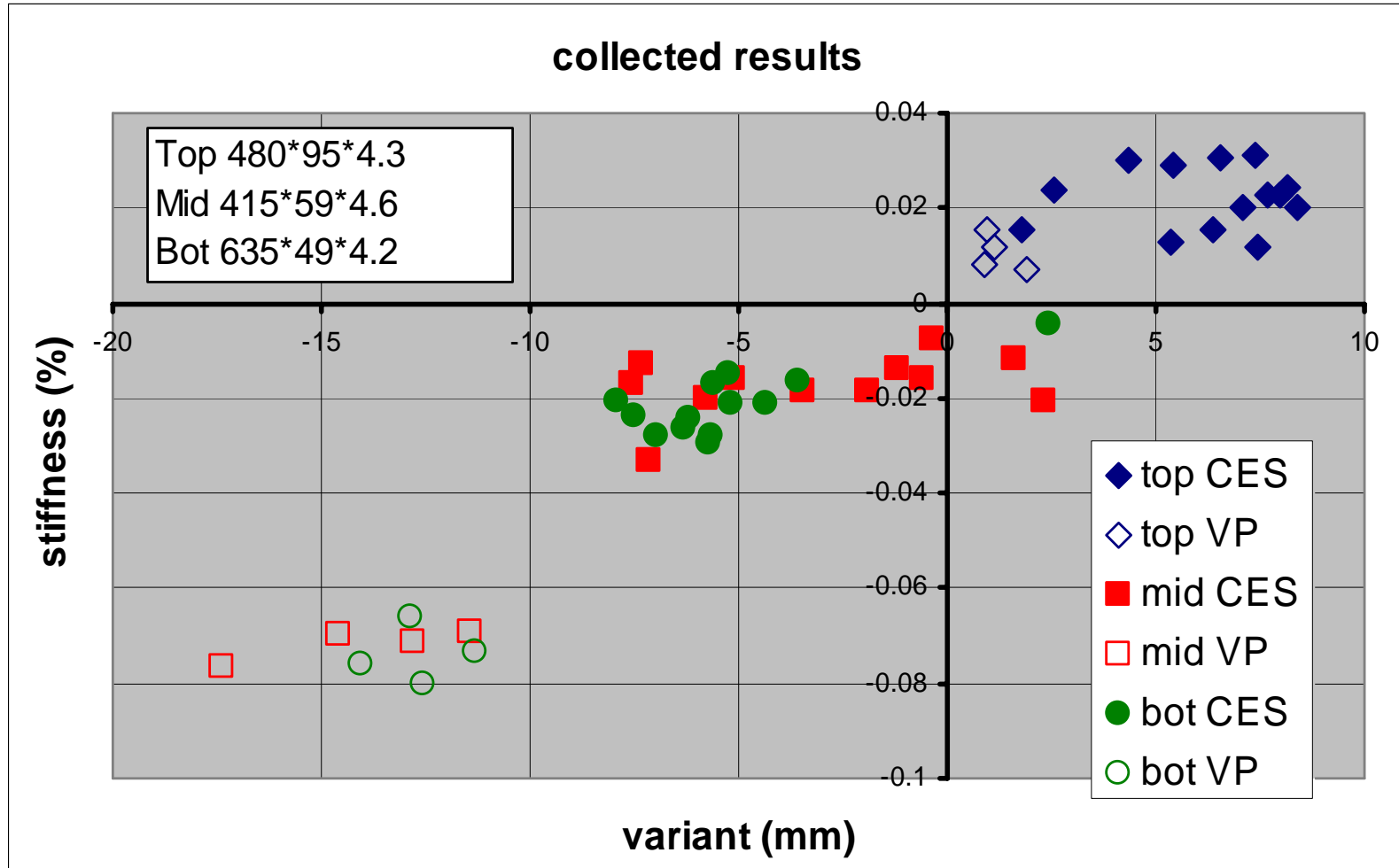
# Unknowns

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- Creak susceptibility in blades is OK
  - In wire clamps (maraging?) issue?
  - In blade clamps (maraging?) issue?
  - Workarounds, eg maraging clamps or “smooth root” blades - but need to know limits to allow cost optimisation.
- Availability
  - What’s the “best” grade to use?
- Processing details
  - Ground surfaces OK? (new understanding from RdS is “YES”)
  - 100 hour treatment may be expensive - is a shorter one OK?
- Vacuum bakeout effects - Riccardo...
- Recent result on wires - why so much weaker?
- Why were some of the CP blades so different from the others?



# Blade test summary results - 1



# Blade test summary results - 2

