

Heat flux computation issue

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Confusion - wrong Input in Reference

Table 6.1: Freestream conditions (taken from Ref. [23])

| M | 5 | 5 | 5 | 10 | 10 | 10 | 15 | 15 | 15 |
|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Re | 10^3 | 10^4 | 10^5 | 10^3 | 10^4 | 10^5 | 10^3 | 10^4 | 10^5 |
| T_∞ (K) | 212 | 212 | 212 | 212 | 212 | 212 | 212 | 212 | 212 |
| p_∞ (Pa) | 1.277 | 12.77 | 127.7 | 1.916 | 19.16 | 191.6 | 1.916 | 19.16 | 191.6 |
| u_∞ (m/s) | 4393 | 4393 | 4393 | 2928 | 2928 | 2928 | 4393 | 4393 | 4393 |
| T_w (K) | 212 | 212 | 212 | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |

ISSN 1349-1113
JAXA-RR-05-001E

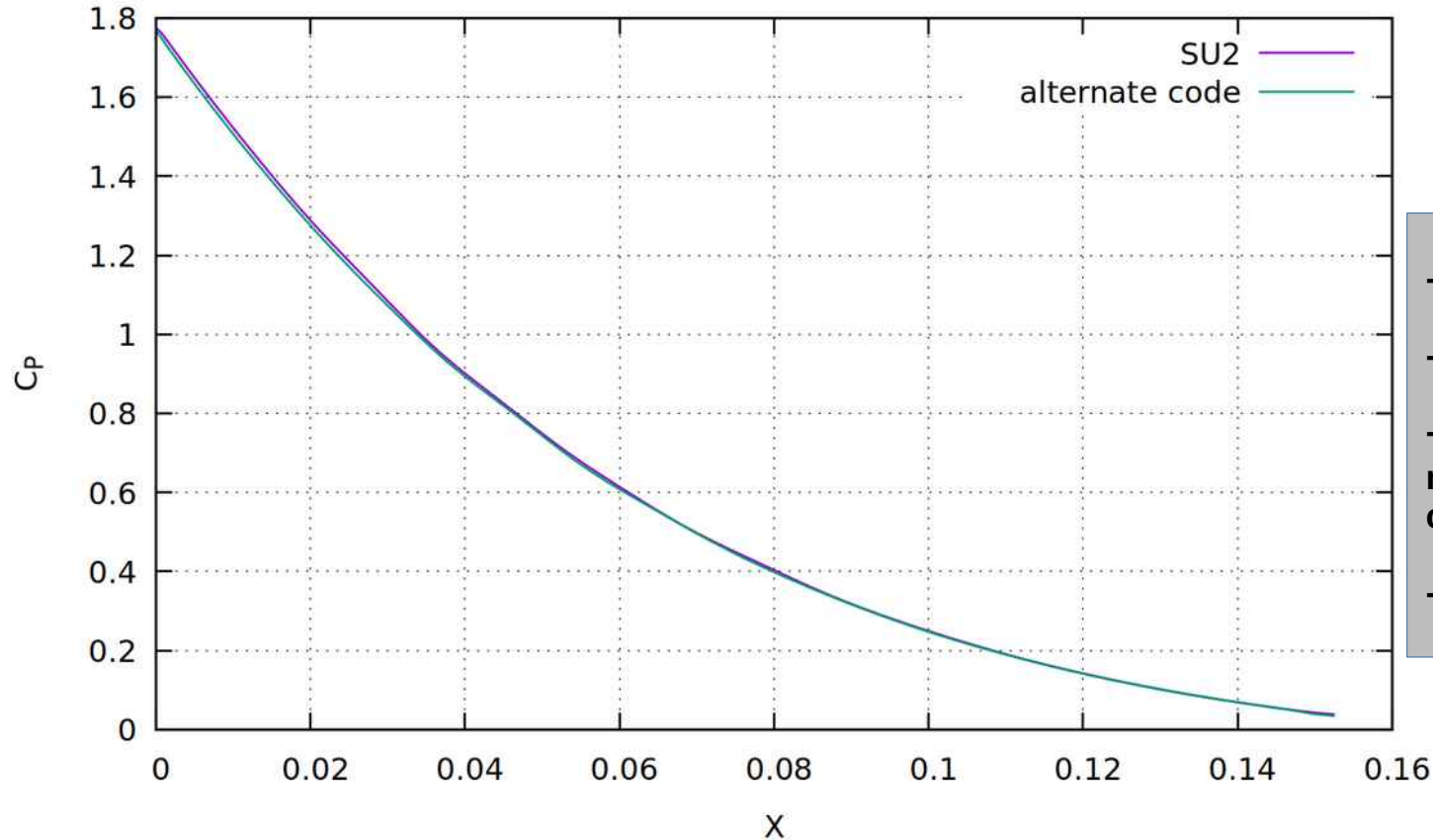
Earlier used input was erroneous from this reference

| | | 15 - 3 | 15 - 4 | 15 - 5 | 10 - 3 | 10 - 4 | 10 - 5 | 5 - 3 | 5 - 4 | 5 - 5 |
|-------------|-----|--------|--------|--------|--------|--------|--------|-------|--------|--------|
| Ma_∞ | | 1 | | | | | | | 5 | 5 |
| Re_∞ | | 1 | | | | | | | 10^4 | 10^5 |
| p_∞ | Pa | 1 | | | | | | 32 | 38.32 | 383.2 |
| v_∞ | m/s | 4 | | | | | | 4 | 1464 | 1464 |

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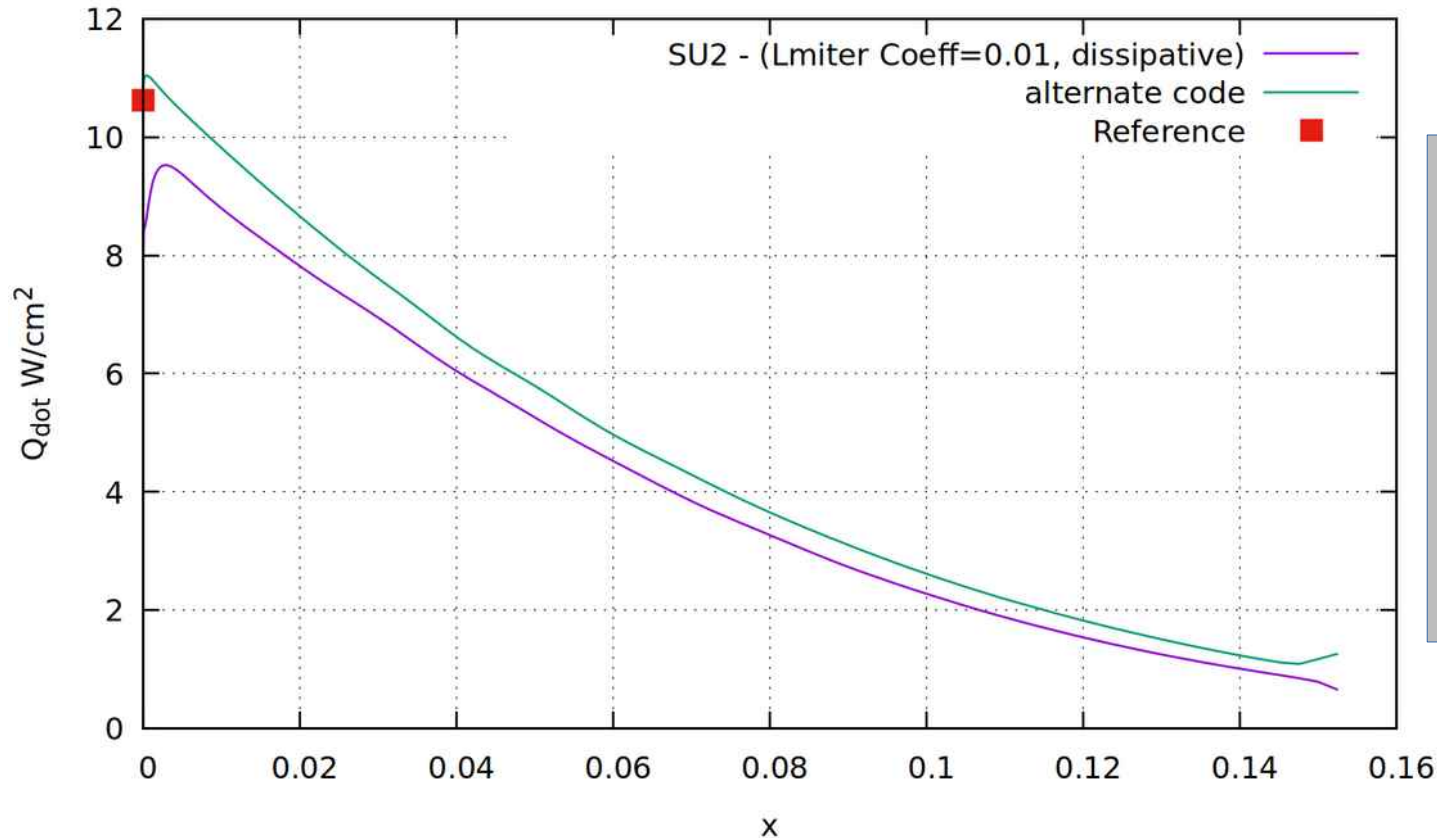
Original Reference - S Muller

Pressure distribution comparison



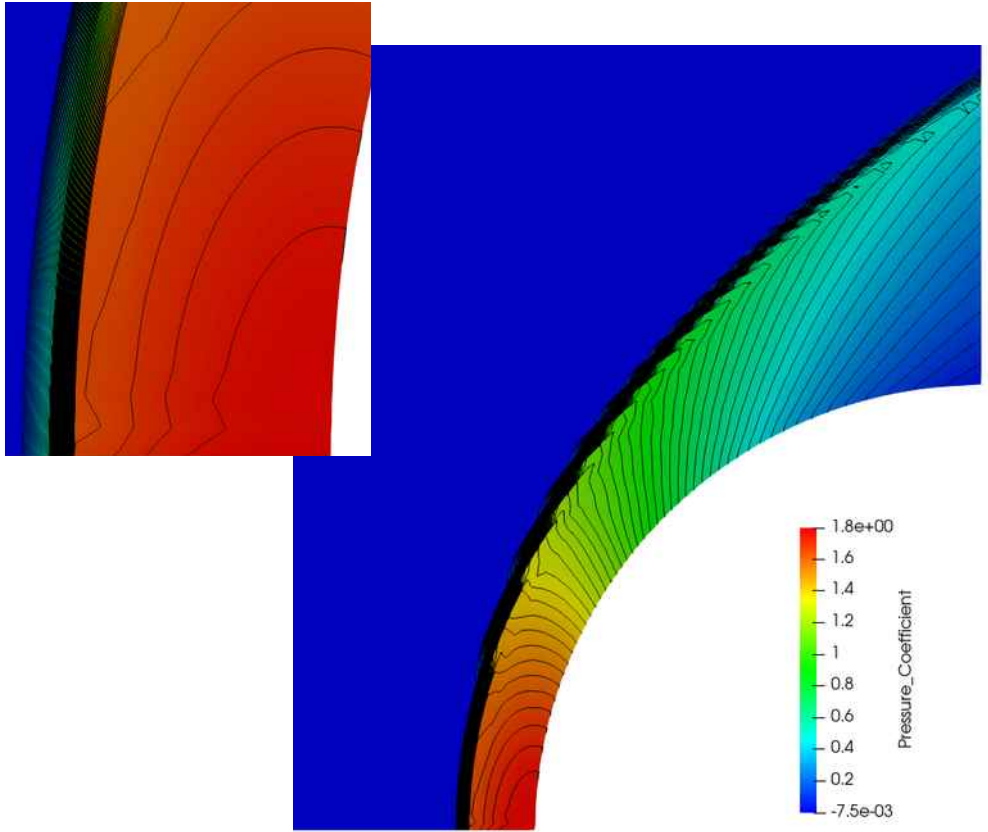
- First cell height $1e-6$
- $y^+ < 0.2$ (from output)
- C_p distribution is smooth and matches well with alternate code
- Axisymmetric fix is good to go

Heat flux comparison

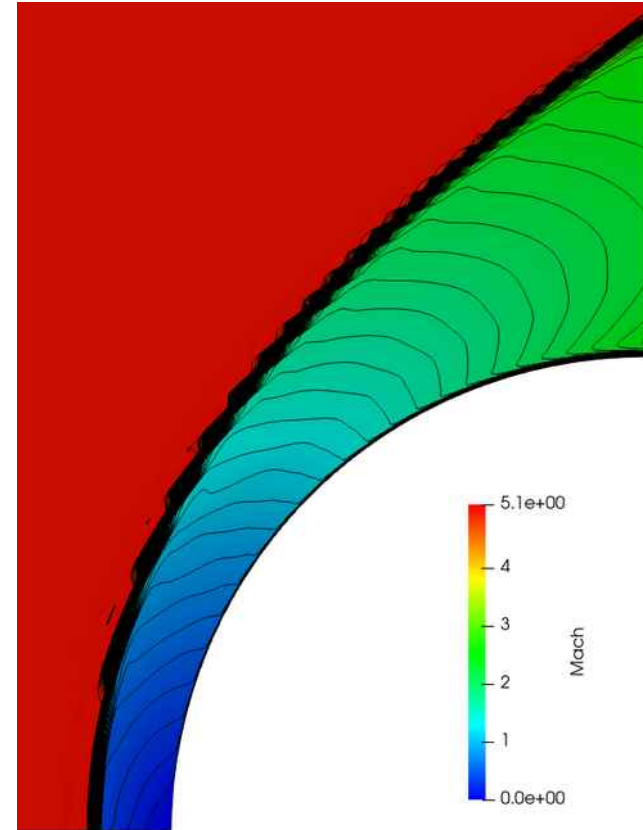


- Could not get stable solution with 2nd order accuracy (tried Various schemes)
- Venkat Limiter coeff. 0.01 and higher E Fix value could give stable solution but resulted in lower accuracy
- Local dip observed in the stagnation region

Contours



C_p contours



Mach contours