

> restart;with(Riemann):with(TensorPack): with(Canon):CDF(0): CDS(index):

**Chapter XX**  
**Tensor analysis using indices - Senovilla et al. - Shearfree for**  
**acceleration parallel to vorticity**

if  $\sigma_{ab}=0 \Rightarrow \omega \ominus = 0$

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file 2d:eq61

> read "EFE" : read "SFE" :read "fids" :read "Seneqs80" :

proof of eq61:

Combining eq60 and eq26 (with the orthogonality assumption):

> eq[60] : T(%);

$$P_{ab} \omega^{b d}{}_{;d} = -\frac{2 p' \theta \omega_a}{\Psi} - \frac{\Psi^{;d} \omega_{ad}}{\Psi} \quad (1.1)$$

> temp := subs(a=-a, TEDS(du[b]·omega[a,-b]=0, eq[26])) : T(%);

$$2 P_a{}^b \theta_{;b} + 3 P_{ab} \omega^{b d}{}_{;d} = 0 \quad (1.2)$$

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> temp1 := expand(Psi·TEDS(eq[60], temp)) : T(%);

$$2 P_a{}^b \theta_{;b} \Psi - 6 p' \theta \omega_a - 3 \Psi^{;d} \omega_{ad} = 0 \quad (1.3)$$

> temp2 := expand(  $\frac{\text{isolate}(temp1, P[-a, b] \cdot \text{theta}[-B] \cdot \text{Psi})}{\text{Psi}}$  ) : T(%);

$$P_a{}^b \theta_{;b} = \frac{3 p' \theta \omega_a}{\Psi} + \frac{3}{2} \frac{\Psi^{;d} \omega_{ad}}{\Psi} \quad (1.4)$$

which is eq61

> convert(temp2, string);

"P[-a,b]\*theta[-B] = 3\*'p'\*theta\*omega[-a]/Psi+3/2/Psi\*Psi[D]\*omega[-a,-d]" (1.5)

> eq[61] := temp2 : T(%);

$$P_a{}^b \theta_{;b} = \frac{3 p' \theta \omega_a}{\Psi} + \frac{3}{2} \frac{\Psi^{;d} \omega_{ad}}{\Psi} \quad (1.6)$$

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