```
> 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 $\sigma_{a\,b}=0 \Rightarrow \omega\Theta=0$

Author: Peter Huf

eq66

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

proof of eq66:

```
> eq[66] := theta[-A]=-dottheta·u[a]+3·`p'`·theta·omega[-a]/Psi : T(%);
```

$$\theta_{;a} = -\mathit{dottheta}\, u^{a} + \frac{3\,p'\,\theta\,\omega_{a}}{\Psi} \tag{1.1}$$

proof: this is a simple substitution for P[a,b] and eq64 into eq61 (see notes p 39)

We commence with eqs61 and 64

```
> eq[61] := parse("P[-a,b]*theta[-B]=3/Psi^2*Psi*`p'`*theta*omega[-a]+3/2/Psi
      ^2*Psi[D]*Psi*omega[-a,-d]"):T(%);
```

$$P_{a}{}^{b}\,\theta_{;b} = \frac{3\,p'\,\theta\,\omega_{a}}{\Psi} + \frac{3}{2}\,\frac{\Psi^{;d}\,\omega_{a\,d}}{\Psi} \tag{1.2}$$

```
> temp := subs(a=-a, b=-d, B=-D, eq[64]) : T(%);
```

$$\omega_{a\,d}\,\Psi^{;d} = 0 \tag{1.3}$$

```
> temp2 := TEDS(temp, eq[61]) : T(%);
```

$$P_{a}{}^{b}\,\theta_{;b} = \frac{3\,p'\,\theta\,\omega_{a}}{\Psi} \tag{1.4}$$

```
> temp3 := Absorbg(expand(TEDS(P[-a,b]=g[-a,b]+u[-a]·u[b], temp2))) : T(%);
```

$$\theta_{;b}\,u^{b}\,u_{a} + \theta_{;a} = \frac{3\,p'\,\theta\,\omega_{a}}{\Psi} \tag{1.5}$$

```
> temp4 := isolate(TEDS(theta[-B]·u[b]=thetadot, temp3), theta[-A]) : T(%);
```

$$\theta_{;a} = \frac{3\,p'\,\theta\,\omega_{a}}{\Psi} - u_{a}\,\mathit{thetadot} \tag{1.6}$$

```
> temp5 := convert(temp4, string) : T(%);
```

"theta[-A] = 3*`p'`*theta*omega[-a]/Psi-u[-a]*thetadot" (1.7)

```
>
>
> eq[66] := parse(temp5) : T(%);
```

(1.8)

$$\theta_{;a} = \frac{3\,p'\,\theta\,\omega_a}{\Psi} - u_a\,thetadot \tag{1.8}$$

>

which is eq66