PKF on 2D multivariate oscillator

March 24, 2021

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Abstract

This notebook illustrates the use of sympkf to build and handle the PKF dynamics associated with the harmonic oscillator as 2D fields given by

$$\left\{\begin{array}{c}\partial_t u = v\\ \partial_t v = -u\end{array}\right.$$

where u and v are functions of t, x, y. For this dynamics, the resulting PKF system is not closed because of the cros-correlation.

1 Definition of the 2D multivariate dynamics

[1]:
```
import sympy
sympy.init_printing()
```

Definition of the dynamics from sympy tools

[2]:
```
from sympy import Function, Derivative, Eq, symbols
from sympkf import SymbolicPKF, t
```

[3]:
```
x, y  = symbols('x y')
u = Function('u')(t,x,y)
v = Function('v')(t,x,y)
dynamics = [Eq(Derivative(u,t), v), Eq(Derivative(v,t), -u)]
dynamics
```

[3]:
$$\left[\frac{\partial}{\partial t}u(t,x,y) = v(t,x,y),\quad \frac{\partial}{\partial t}v(t,x,y) = -u(t,x,y)\right]$$

2 Computation of the PKF dynamics by using SymPKF

[4]:
```
pkf_dynamics = SymbolicPKF(dynamics)
```

[5]:
```
for equation in pkf_dynamics.in_metric:    display(equation)
```

$$\frac{\partial}{\partial t} u(t,x,y) = v(t,x,y)$$

$$\frac{\partial}{\partial t} v(t,x,y) = -u(t,x,y)$$

$$\frac{\partial}{\partial t} \mathrm{V_u}\left(t,x,y\right) = 2\,\mathrm{V_{uv}}\left(t,x,y\right)$$

$$\frac{\partial}{\partial t} \mathrm{V_v}\left(t,x,y\right) = -2\,\mathrm{V_{uv}}\left(t,x,y\right)$$

$$\frac{\partial}{\partial t} \mathrm{V_{uv}}\left(t,x,y\right) = -\mathrm{V_u}\left(t,x,y\right) + \mathrm{V_v}\left(t,x,y\right)$$

$$\frac{\partial}{\partial t} \mathrm{g_{u,xx}}\left(t,x,y\right) = -\frac{2\,\mathrm{V_{uv}}\left(t,x,y\right)\mathrm{g_{u,xx}}\left(t,x,y\right)}{\mathrm{V_u}\left(t,x,y\right)} + \frac{2\sqrt{\mathrm{V_v}\left(t,x,y\right)}\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}} + \frac{\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}} - \frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_u}\left(t,x,y\right)}{\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)}$$

$$\frac{\partial}{\partial t} \mathrm{g_{u,xy}}\left(t,x,y\right) = -\frac{2\,\mathrm{V_{uv}}\left(t,x,y\right)\mathrm{g_{u,xy}}\left(t,x,y\right)}{\mathrm{V_u}\left(t,x,y\right)} + \frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}} + \frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}} + \frac{\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_v}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}} + \frac{\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_v}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}} - \frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_u}\left(t,x,y\right)}{2\,\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)} - \frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_u}\left(t,x,y\right)}{2\,\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)}$$

$$\frac{\partial}{\partial t} \mathrm{g_{u,yy}}\left(t,x,y\right) = -\frac{2\,\mathrm{V_{uv}}\left(t,x,y\right)\mathrm{g_{u,yy}}\left(t,x,y\right)}{\mathrm{V_u}\left(t,x,y\right)} + \frac{2\sqrt{\mathrm{V_v}\left(t,x,y\right)}\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}} + \frac{\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}} - \frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_u}\left(t,x,y\right)}{\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)}$$

$$\frac{\partial}{\partial t} \mathrm{g_{v,xx}}\left(t,x,y\right) = \frac{2\,\mathrm{V_{uv}}\left(t,x,y\right)\mathrm{g_{v,xx}}\left(t,x,y\right)}{\mathrm{V_v}\left(t,x,y\right)} - \frac{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_v}\left(t,x,y\right)}} + \frac{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_v}\left(t,x,y\right)}{\mathrm{V_v}^{\frac{3}{2}}\left(t,x,y\right)} - \frac{\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_u}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}}$$

$$\frac{\partial}{\partial t} \mathrm{g_{v,xy}}\left(t,x,y\right) = \frac{2\,\mathrm{V_{uv}}\left(t,x,y\right)\mathrm{g_{v,xy}}\left(t,x,y\right)}{\mathrm{V_v}\left(t,x,y\right)} - \frac{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_v}\left(t,x,y\right)}} -$$

$$\frac{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_v}\left(t,x,y\right)}}+\frac{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_v}\left(t,x,y\right)}{2\,\mathrm{V_v}^{\frac{3}{2}}\left(t,x,y\right)}+$$
$$\frac{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_v}\left(t,x,y\right)}{2\,\mathrm{V_v}^{\frac{3}{2}}\left(t,x,y\right)}-\frac{\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_u}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}}-$$
$$\frac{\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_u}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}}$$

$$\frac{\partial}{\partial t}\,\mathrm{g_{v,yy}}\left(t,x,y\right)=\frac{2\,\mathrm{V_{uv}}\left(t,x,y\right)\mathrm{g_{v,yy}}\left(t,x,y\right)}{\mathrm{V_v}\left(t,x,y\right)}-\frac{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_v}\left(t,x,y\right)}}+$$
$$\frac{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_v}\left(t,x,y\right)}{\mathrm{V_v}^{\frac{3}{2}}\left(t,x,y\right)}-\frac{\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_u}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}}$$

[6]:
```
for equation in pkf_dynamics.in_aspect:    display(equation)
```

$$\frac{\partial}{\partial t}u(t,x,y)=v(t,x,y)$$

$$\frac{\partial}{\partial t}v(t,x,y)=-u(t,x,y)$$

$$\frac{\partial}{\partial t}\,\mathrm{V_u}\left(t,x,y\right)=2\,\mathrm{V_{uv}}\left(t,x,y\right)$$

$$\frac{\partial}{\partial t}\,\mathrm{V_v}\left(t,x,y\right)=-2\,\mathrm{V_{uv}}\left(t,x,y\right)$$

$$\frac{\partial}{\partial t}\,\mathrm{V_{uv}}\left(t,x,y\right)=-\,\mathrm{V_u}\left(t,x,y\right)+\mathrm{V_v}\left(t,x,y\right)$$

$$\frac{\partial}{\partial t}\,\mathrm{s_{u,xx}}\left(t,x,y\right)=\frac{2\,\mathrm{V_{uv}}\left(t,x,y\right)\mathrm{s_{u,xx}}\left(t,x,y\right)}{\mathrm{V_u}\left(t,x,y\right)}-\frac{2\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,{\mathrm{s_{u,xx}}}^{2}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}}-$$
$$\frac{2\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,xy}}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}}-$$
$$\frac{2\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,xy}}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}}-$$
$$\frac{2\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,{\mathrm{s_{u,xy}}}^{2}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}}-\frac{{\mathrm{s_{u,xx}}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V}}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}}$$
$$\frac{\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,xy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}}-$$
$$\frac{\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,xy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}}-$$
$$\frac{{\mathrm{s_{u,xy}}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}}+\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,{\mathrm{s_{u,xx}}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y\right.\right.}{\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)}$$

$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,xy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_u}\left(t,x,y\right)}{\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)} +$$
$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,xy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_u}\left(t,x,y\right)}{\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)} +$$
$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_u}\left(t,x,y\right)}{\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)}$$

$$\frac{\partial}{\partial t}\mathrm{s_{u,xy}}\left(t,x,y\right)=\frac{2\,\mathrm{V_{uv}}\left(t,x,y\right)\mathrm{s_{u,xy}}\left(t,x,y\right)}{\mathrm{V_u}\left(t,x,y\right)}-\frac{2\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,xy}}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}}$$
$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}} -$$
$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}} -$$
$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}}-\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(\right.\right.}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}}$$
$$\frac{2\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xy}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}} -$$
$$\frac{\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,xy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}} -$$
$$\frac{\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_v}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}} -$$
$$\frac{\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_v}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}} -$$
$$\frac{\mathrm{s_{u,xy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_v}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}}-\frac{\mathrm{s_{u,xy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_v}\left(t\right.}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}}$$
$$\frac{\mathrm{s_{u,xy}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}} +$$
$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,xy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_u}\left(t,x,y\right)}{\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)} +$$
$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_u}\left(t,x,y\right)}{2\,\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)} +$$
$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xx}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_u}\left(t,x,y\right)}{2\,\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)} +$$
$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_u}\left(t,x,y\right)}{2\,\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)} +$$
$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_u}\left(t,x,y\right)}{2\,\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)} +$$

$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xy}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\,\mathrm{V_u}\left(t,x,y\right)}{\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)}$$

$$\frac{\partial}{\partial t}\,\mathrm{s_{u,yy}}\left(t,x,y\right)=\frac{2\,\mathrm{V_{uv}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)}{\mathrm{V_u}\left(t,x,y\right)}-\frac{2\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xy}}^2\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}}-$$

$$\frac{2\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xy}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}}-$$

$$\frac{2\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xy}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}}-$$

$$\frac{2\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,yy}}^2\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}}-\frac{\mathrm{s_{u,xy}}^2\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\,\mathrm{V}}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}}$$

$$\frac{\mathrm{s_{u,xy}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\,\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}}-$$

$$\frac{\mathrm{s_{u,xy}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\,\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}}-$$

$$\frac{\mathrm{s_{u,yy}}^2\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\,\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\sqrt{\mathrm{V_v}\left(t,x,y\right)}}+\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xy}}^2\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{u}}\left(t,x,y\right.\right.}{\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)}$$

$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xy}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\,\mathrm{V_u}\left(t,x,y\right)}{\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)}+$$

$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,xy}}\left(t,x,y\right)\mathrm{s_{u,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\,\mathrm{V_u}\left(t,x,y\right)}{\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)}+$$

$$\frac{\sqrt{\mathrm{V_v}\left(t,x,y\right)}\,\mathrm{s_{u,yy}}^2\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\,\mathrm{V_u}\left(t,x,y\right)}{\mathrm{V_u}^{\frac{3}{2}}\left(t,x,y\right)}$$

$$\frac{\partial}{\partial t}\,\mathrm{s_{v,xx}}\left(t,x,y\right)=-\frac{2\,\mathrm{V_{uv}}\left(t,x,y\right)\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{5}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}^2\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^2\left(t,x,y\right)}+$$

$$\frac{2\,\mathrm{V_{uv}}\left(t,x,y\right)\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{5}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,xy}}^2\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^2\left(t,x,y\right)}+$$

$$\frac{2\,\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^3\left(t,x,y\right)\mathrm{s_{v,xx}}^3\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^2\left(t,x,y\right)}-$$

$$\frac{2\,\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^3\left(t,x,y\right)\mathrm{s_{v,xx}}^2\left(t,x,y\right)\mathrm{s_{v,xy}}^2\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^2\left(t,x,y\right)}+$$

$$\frac{2\,\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^3\left(t,x,y\right)\mathrm{s_{v,xx}}^2\left(t,x,y\right)\mathrm{s_{v,xy}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^2\left(t,x,y\right)}+$$

$$\frac{2\,\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^3\left(t,x,y\right)\mathrm{s_{v,xx}}^2\left(t,x,y\right)\mathrm{s_{v,xy}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^2\left(t,x,y\right)}-$$

$$\frac{2\,\mathrm{V_u}(t,x,y)\,{\mathrm{V_v}}^3(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,{\mathrm{s_{v,xy}}}^3(t,x,y)\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}-$$
$$\frac{2\,\mathrm{V_u}(t,x,y)\,{\mathrm{V_v}}^3(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,{\mathrm{s_{v,xy}}}^3(t,x,y)\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}+$$
$$\frac{2\,\mathrm{V_u}(t,x,y)\,{\mathrm{V_v}}^3(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}-$$
$$\frac{2\,\mathrm{V_u}(t,x,y)\,{\mathrm{V_v}}^3(t,x,y)\,{\mathrm{s_{v,xy}}}^4(t,x,y)\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}-$$
$$\frac{\mathrm{V_u}(t,x,y)\,{\mathrm{V_v}}^2(t,x,y)\,{\mathrm{s_{v,xx}}}^3(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial x}\mathrm{V_v}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}+$$
$$\frac{\mathrm{V_u}(t,x,y)\,{\mathrm{V_v}}^2(t,x,y)\,{\mathrm{s_{v,xx}}}^2(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial x}\mathrm{V_v}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}-$$
$$\frac{\mathrm{V_u}(t,x,y)\,{\mathrm{V_v}}^2(t,x,y)\,{\mathrm{s_{v,xx}}}^2(t,x,y)\,\mathrm{s_{v,xy}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial y}\mathrm{V_v}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}-$$
$$\frac{\mathrm{V_u}(t,x,y)\,{\mathrm{V_v}}^2(t,x,y)\,{\mathrm{s_{v,xx}}}^2(t,x,y)\,\mathrm{s_{v,xy}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial x}\mathrm{V_v}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}+$$
$$\frac{\mathrm{V_u}(t,x,y)\,{\mathrm{V_v}}^2(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,{\mathrm{s_{v,xy}}}^3(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial y}\mathrm{V_v}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}+$$
$$\frac{\mathrm{V_u}(t,x,y)\,{\mathrm{V_v}}^2(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,{\mathrm{s_{v,xy}}}^3(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial x}\mathrm{V_v}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}-$$
$$\frac{\mathrm{V_u}(t,x,y)\,{\mathrm{V_v}}^2(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial y}\mathrm{V_v}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}+$$
$$\frac{\mathrm{V_u}(t,x,y)\,{\mathrm{V_v}}^2(t,x,y)\,{\mathrm{s_{v,xy}}}^4(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial y}\mathrm{V_v}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}+$$
$$\frac{{\mathrm{V_v}}^3(t,x,y)\,{\mathrm{s_{v,xx}}}^3(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial x}\mathrm{V_u}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}-$$
$$\frac{{\mathrm{V_v}}^3(t,x,y)\,{\mathrm{s_{v,xx}}}^2(t,x,y)\,\mathrm{s_{v,xy}}(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial x}\mathrm{V_u}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}+$$
$$\frac{{\mathrm{V_v}}^3(t,x,y)\,{\mathrm{s_{v,xx}}}^2(t,x,y)\,\mathrm{s_{v,xy}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial y}\mathrm{V_u}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}+$$
$$\frac{{\mathrm{V_v}}^3(t,x,y)\,{\mathrm{s_{v,xx}}}^2(t,x,y)\,\mathrm{s_{v,xy}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial x}\mathrm{V_u}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}-$$
$$\frac{{\mathrm{V_v}}^3(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,{\mathrm{s_{v,xy}}}^3(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial y}\mathrm{V_u}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}+$$
$$\frac{{\mathrm{V_v}}^3(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,{\mathrm{s_{v,xy}}}^3(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial x}\mathrm{V_u}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,{\mathrm{V_v}}^{\frac{7}{2}}(t,x,y)\,{\mathrm{s_{v,xy}}}^2(t,x,y)}+$$

$$\frac{\mathrm{V_v}^3(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial y}\mathrm{V_u}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}-$$
$$\frac{\mathrm{V_v}^3(t,x,y)\,\mathrm{s_{v,xy}}^4(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial y}\mathrm{V_u}(t,x,y)}{\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}$$

$$\frac{\partial}{\partial t}\mathrm{s_{v,xy}}(t,x,y)=-\frac{4\,\mathrm{V_{uv}}(t,x,y)\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{5}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,xy}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}+$$
$$\frac{4\,\mathrm{V_{uv}}(t,x,y)\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{5}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^3(t,x,y)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}+$$
$$\frac{4\,\mathrm{V_u}(t,x,y)\,\mathrm{V_v}^3(t,x,y)\,\mathrm{s_{v,xx}}^2(t,x,y)\,\mathrm{s_{v,xy}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}+$$
$$\frac{2\,\mathrm{V_u}(t,x,y)\,\mathrm{V_v}^3(t,x,y)\,\mathrm{s_{v,xx}}^2(t,x,y)\,\mathrm{s_{v,yy}}^2(t,x,y)\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}+$$
$$\frac{2\,\mathrm{V_u}(t,x,y)\,\mathrm{V_v}^3(t,x,y)\,\mathrm{s_{v,xx}}^2(t,x,y)\,\mathrm{s_{v,yy}}^2(t,x,y)\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}-$$
$$\frac{4\,\mathrm{V_u}(t,x,y)\,\mathrm{V_v}^3(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,xy}}^3(t,x,y)\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}+$$
$$\frac{4\,\mathrm{V_u}(t,x,y)\,\mathrm{V_v}^3(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,xy}}(t,x,y)\,\mathrm{s_{v,yy}}^2(t,x,y)\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}-$$
$$\frac{2\,\mathrm{V_u}(t,x,y)\,\mathrm{V_v}^3(t,x,y)\,\mathrm{s_{v,xy}}^4(t,x,y)\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}-$$
$$\frac{2\,\mathrm{V_u}(t,x,y)\,\mathrm{V_v}^3(t,x,y)\,\mathrm{s_{v,xy}}^4(t,x,y)\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}-$$
$$\frac{4\,\mathrm{V_u}(t,x,y)\,\mathrm{V_v}^3(t,x,y)\,\mathrm{s_{v,xy}}^3(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}-$$
$$\frac{2\,\mathrm{V_u}(t,x,y)\,\mathrm{V_v}^2(t,x,y)\,\mathrm{s_{v,xx}}^2(t,x,y)\,\mathrm{s_{v,xy}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial x}\mathrm{V_v}(t,x,y)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}-$$
$$\frac{\mathrm{V_u}(t,x,y)\,\mathrm{V_v}^2(t,x,y)\,\mathrm{s_{v,xx}}^2(t,x,y)\,\mathrm{s_{v,yy}}^2(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial y}\mathrm{V_v}(t,x,y)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}-$$
$$\frac{\mathrm{V_u}(t,x,y)\,\mathrm{V_v}^2(t,x,y)\,\mathrm{s_{v,xx}}^2(t,x,y)\,\mathrm{s_{v,yy}}^2(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial x}\mathrm{V_v}(t,x,y)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}+$$
$$\frac{2\,\mathrm{V_u}(t,x,y)\,\mathrm{V_v}^2(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,xy}}^3(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial x}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial x}\mathrm{V_v}(t,x,y)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}-$$
$$\frac{2\,\mathrm{V_u}(t,x,y)\,\mathrm{V_v}^2(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,xy}}(t,x,y)\,\mathrm{s_{v,yy}}^2(t,x,y)\mathbb{E}\left(\varepsilon_\mathrm{u}(t,x,y,\omega)\frac{\partial}{\partial y}\varepsilon_\mathrm{v}(t,x,y,\omega)\right)\frac{\partial}{\partial y}\mathrm{V_v}(t,x,y)}{2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xx}}(t,x,y)\,\mathrm{s_{v,yy}}(t,x,y)-2\sqrt{\mathrm{V_u}(t,x,y)}\,\mathrm{V_v}^{\frac{7}{2}}(t,x,y)\,\mathrm{s_{v,xy}}^2(t,x,y)}+$$

$$\frac{\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{2}\left(t,x,y\right)\mathrm{s_{v,xy}}^{4}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_v}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+$$
$$\frac{\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{2}\left(t,x,y\right)\mathrm{s_{v,xy}}^{4}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_v}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+$$
$$\frac{2\,\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{2}\left(t,x,y\right)\mathrm{s_{v,xy}}^{3}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_v}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+$$
$$\frac{2\,\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xx}}^{2}\left(t,x,y\right)\mathrm{s_{v,xy}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_u}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+$$
$$\frac{\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xx}}^{2}\left(t,x,y\right)\mathrm{s_{v,yy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_u}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+$$
$$\frac{\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xx}}^{2}\left(t,x,y\right)\mathrm{s_{v,yy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_u}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-$$
$$\frac{2\,\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{3}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_u}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+$$
$$\frac{2\,\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,xy}}\left(t,x,y\right)\mathrm{s_{v,yy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_u}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-$$
$$\frac{\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xy}}^{4}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_u}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-$$
$$\frac{\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xy}}^{4}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\mathrm{V_u}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-$$
$$\frac{2\,\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xy}}^{3}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_u}\left(t,x,y\right)}{2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-2\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}$$

$$\frac{\partial}{\partial t}\mathrm{s_{v,yy}}\left(t,x,y\right)=-\frac{2\,\mathrm{V_{uv}}\left(t,x,y\right)\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{5}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}^{2}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+$$
$$\frac{2\,\mathrm{V_{uv}}\left(t,x,y\right)\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{5}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+$$
$$\frac{2\,\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+$$
$$\frac{2\,\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,xy}}\left(t,x,y\right)\mathrm{s_{v,yy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+$$
$$\frac{2\,\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,xy}}\left(t,x,y\right)\mathrm{s_{v,yy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+$$
$$\frac{2\,\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}^{3}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial y}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-$$
$$\frac{2\,\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xy}}^{4}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial x}\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-$$

$$
\begin{aligned}
&\frac{2\,\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xy}}^{3}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-\\
&\frac{2\,\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xy}}^{3}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-\\
&\frac{2\,\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)\mathrm{s_{v,yy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-\\
&\frac{\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{2}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\,\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-\\
&\frac{\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{2}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,xy}}\left(t,x,y\right)\mathrm{s_{v,yy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\,\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-\\
&\frac{\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{2}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,xy}}\left(t,x,y\right)\mathrm{s_{v,yy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\,\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-\\
&\frac{\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{2}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}^{3}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\,\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+\\
&\frac{\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{2}\left(t,x,y\right)\mathrm{s_{v,xy}}^{4}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\,\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+\\
&\frac{\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{2}\left(t,x,y\right)\mathrm{s_{v,xy}}^{3}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\,\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+\\
&\frac{\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{2}\left(t,x,y\right)\mathrm{s_{v,xy}}^{3}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\,\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+\\
&\frac{\mathrm{V_u}\left(t,x,y\right)\mathrm{V_v}^{2}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)\mathrm{s_{v,yy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\,\mathrm{V_v}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+\\
&\frac{\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\,\mathrm{V_u}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+\\
&\frac{\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,xy}}\left(t,x,y\right)\mathrm{s_{v,yy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\,\mathrm{V_u}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+\\
&\frac{\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,xy}}\left(t,x,y\right)\mathrm{s_{v,yy}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\,\mathrm{V_u}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}+\\
&\frac{\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}^{3}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\,\mathrm{V_u}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-\\
&\frac{\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xy}}^{4}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\,\mathrm{V_u}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-\\
&\frac{\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xy}}^{3}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial x}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\,\mathrm{V_u}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-\\
&\frac{\mathrm{V_v}^{3}\left(t,x,y\right)\mathrm{s_{v,xy}}^{3}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\,\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial x}\,\mathrm{V_u}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}\,\mathrm{V_v}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xy}}^{2}\left(t,x,y\right)}-
\end{aligned}
$$

$$\frac{{\mathrm{V_v}}^{3}\left(t,x,y\right){\mathrm{s_{v,xy}}}^{2}\left(t,x,y\right){\mathrm{s_{v,yy}}}^{2}\left(t,x,y\right)\mathbb{E}\left(\varepsilon_{\mathrm{u}}\left(t,x,y,\omega\right)\frac{\partial}{\partial y}\varepsilon_{\mathrm{v}}\left(t,x,y,\omega\right)\right)\frac{\partial}{\partial y}\mathrm{V_u}\left(t,x,y\right)}{\sqrt{\mathrm{V_u}\left(t,x,y\right)}{\mathrm{V_v}}^{\frac{7}{2}}\left(t,x,y\right)\mathrm{s_{v,xx}}\left(t,x,y\right)\mathrm{s_{v,yy}}\left(t,x,y\right)-\sqrt{\mathrm{V_u}\left(t,x,y\right)}{\mathrm{V_v}}^{\frac{7}{2}}\left(t,x,y\right){\mathrm{s_{v,xy}}}^{2}\left(t,x,y\right)}$$