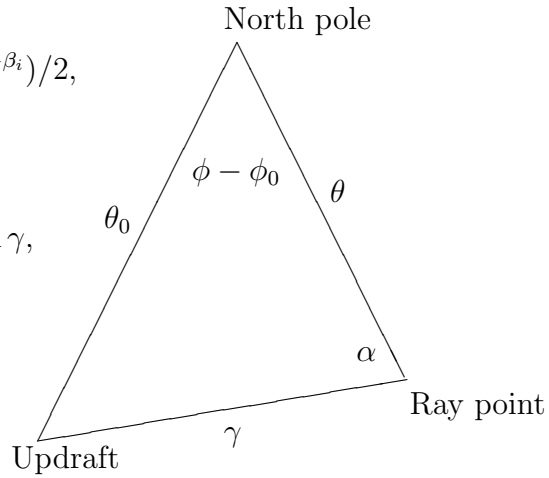
FORM TO SPECIFY INPUT DATA FOR WIND/CURRENT PERTURBATION MODEL VDRAFT2

$v_r = v_{r0} + \frac{1}{r \sin\gamma} \frac{\partial \psi \sin\gamma}{\partial \gamma}$, $v_\theta = v_{\theta 0} + v_H \cos\alpha$, $v_\phi = v_{\phi 0} + v_H \sin\alpha$,
$v_H = -\frac{1}{r} \frac{\partial r\psi}{\partial r}$, where v_{r0}, $v_{\theta 0}$, and $v_{\phi 0}$
are given by a background wind model,
$\psi = \sum_{i=1}^{2} \psi_{Ai}(h)\psi_{Bi}(\gamma)\psi_{Ci}(h)$,
$\psi_{Ai}(h) = \frac{h^2}{h_i^2 + h^2}$, $\psi_{Bi}(\gamma) \sin\gamma = r_e w_i \sin^2\gamma_i (1 - e^{-\beta_i})/2$,
$\psi_{Ci}(h) = (1 - \tanh((h - z_i)/\delta_i))/2$,
$\beta_i = \frac{\sin^2\gamma}{\sin^2\gamma_i}$, $h = r - r_e$,
$\cos\gamma = \sin\lambda_0 \cos\theta + \cos\lambda_0 \sin\theta \cos(\phi - \phi_0)$,
$\cos\alpha = [\sin\theta \cos\theta_0 - \sin\theta_0 \cos\theta \cos(\phi - \phi_0)]/\sin\gamma$,
$\sin\alpha = \sin\theta_0 \sin(\phi - \phi_0)/\sin\gamma$,
$\theta_0 = \pi/2 - \lambda_0$



This model represents the wind/current velocity of an updraft plus a down draft. This model is based on a stream function, so it has zero divergence in three dimensions. The flow is capped at the top and bottom.
Specify–
the model check for VDRAFT2 = 2.0 (w125)
the input data-format code = _____ (w126)
an input data-set identification number = _____ (w127)
an 80-character description of the model with parameters:

_____

and the model values:
λ_0 latitude of the updraft/downdraft _____ rad, deg, km (w128)
ϕ_0 longitude of the updraft/downdraft _____ rad, deg, km (w129)
w_1 maximum speed of the updraft _____ km/s, m/s (w130)
γ_1 half width of the updraft _____ rad, deg, km (w131)
h_1 depth of the inflow _____ km, m (w132)
w_2 maximum speed of the downdraft _____ km/s, m/s (w133)
γ_2 half width of the downdraft _____ rad, deg, km (w134)
h_2 depth of the outflow _____ km, m (w135)
z_1 height of the return outflow at the top _____ km, m (w136)
δ_1 width of the return outflow at the top _____ km, m (w137)
z_2 height of the return inflow at the top _____ km, m (w138)
δ_2 width of the return inflow at the top _____ km, m (w139)

OTHER MODELS REQUIRED: Any background wind/current velocity model.

In the subroutine, v_r, v_θ, v_ϕ, and v_H are used for the perturbation.

Definitions:

FORTRAN variable	Variable name	Definition
LAMBDA0	λ_0	Latitude of updraft/downdraft
PHI0	ϕ_0	Longitude of updraft/downdraft
W1	w_1	Maximum speed of updraft
W2	w_2	Maximum speed of downdraft
GAMMA1	γ_1	Half width of updraft
GAMMA2	γ_2	Half width of downdraft
H1	h_1	Depth of inflow
H2	h_2	Depth of outflow
z1	z_1	Height of the return outflow at the top
z2	z_2	Height of the return inflow at the top
delta1	δ_1	Width of the return outflow at the top
delta2	δ_2	Width of the return inflow at the top
EARTHR	r_e	Radius of the Earth
EARSQ	r_e^2	
SING1SQ	$\sin^2\gamma_1$	
SING2SQ	$\sin^2\gamma_2$	
SINLAM0	$\sin\lambda_0$	
	θ_0	Co-latitude of updraft/downdraft
COSTH0	$\cos\theta_0$	
COSLAM0	$\cos\lambda_0$	
SINTH0	$\sin\theta_0$	
H1SQ	h_1^2	
H2SQ	h_2^2	
CONST1	$r_e w_1/2$	
CONST2	$r_e w_2/2$	
VH	v_H	Horizontal component of wind velocity perturbat
	r	Distance from center of Earth to ray point
RSQ	r^2	
H	h	Height of ray point above sea level
HSQ	h^2	
HCUBE	h^3	
	θ	Co-latitude of ray point
COSTH	$\cos\theta$	
SINTH	$\sin\theta$	
PH	ϕ	Longitude of ray point
COSPH	$\cos(\phi-\phi_0)$	
SINPH	$\sin(\phi-\phi_0)$	
	γ	Great circle angle between updraft/downdraft and ray point
COSGAM	$\cos\gamma$	
SINGAM	$\sin\gamma$	
SINGSQ	$\sin^2\gamma$	
psi	$\psi=\psi_1+\psi_2$	Stream function

psisg	$\psi \sin\gamma = \psi_1 \sin\gamma + \psi_2 \sin\gamma$	
psi1	$\psi_1 = \psi_{A1}\psi_{B1}\psi_{C1}$	
psi1sg	$\psi_1 \sin\gamma = \psi_{A1}\psi_{B1}\sin\gamma\psi_{C1}$	
psi2	$\psi_2 = \psi_{A2}\psi_{B2}\psi_{C2}$	
psi2sg	$\psi_2 \sin\gamma = \psi_{A2}\psi_{B2}\sin\gamma\psi_{C2}$	
psiA1	ψ_{A1}	
psiB1	ψ_{B1}	
psiB1sg	$\psi_{B1}\sin\gamma$	
psiC1	ψ_{C1}	
psiA2	ψ_{A2}	
psiB2	ψ_{B2}	
psiB2sg	$\psi_{B2}\sin\gamma$	
psiC2	ψ_{C2}	
BETA	$\beta = \sin^2\gamma/\sin^2\gamma_1$ or $\sin^2\gamma/\sin^2\gamma_2$	
EXBET	$e^{-\beta}$	
SUM	$h_1^2 + h^2$ or $h_2^2 + h^2$	
SUMSQ	$(h_1^2 + h^2)^2$ or $(h_2^2 + h^2)^2$	
VR	$v_r = -\frac{1}{r^2}\frac{\partial\psi}{\partial\cos\gamma}$	Vertical component of wind velocity perturbation
PVRR	$\partial v_r/\partial r = -(\partial^2\psi/\partial h\partial\cos\gamma)/r^2 + 2(\partial\psi/\partial\cos\gamma)/r^3$	
SGPGTH	$-\partial\cos\gamma/\partial\theta = \sin\gamma\partial\gamma/\partial\theta$	
SGPGPH	$-\partial\cos\gamma/\partial\phi = \sin\gamma\partial\gamma/\partial\phi$	
PVRTH	$\partial v_r/\partial\theta$	
PVRPH	$\partial v_r/\partial\phi$	
VH	$v_H = -\frac{\partial\psi/\partial h}{r\sin\gamma}$	horizontal component of wind velocity perturatio
	α	azimuth angle of updraft counter-clockwise from North as viewed from ray point
SINALP	$\sin\alpha$	
SINALPSQ	$\sin^2\alpha$	
COSALP	$\cos\alpha$	
COSALPSQ	$\cos^2\alpha$	
COS2ALP	$\cos 2\alpha$	
VTH	v_θ	Southward component of wind velocity perturbat
VPH	v_ϕ	Eastward component of wind velocity perturbati
PVHR	$\partial v_H/\partial r$	
PVTHR	$\partial v_\theta/\partial r$	
PSINALPTH	$\partial\sin\alpha/\partial\theta$	
PSINALPPH	$\partial\sin\alpha/\partial\phi$	
PCOSALPTH	$\partial\cos\alpha/\partial\theta$	
PCOSALPPH	$\partial\cos\alpha/\partial\phi$	
PVHPG	$\partial v_H/\partial\cos\gamma = -1/\sin\gamma\partial v_H/\partial\gamma$	
PVHTH	$\partial v_H/\partial\theta$	
PVHPH	$\partial v_H/\partial\phi$	
PVTHTH	$\partial v_\theta/\partial\theta$	
PVTHPH	$\partial v_\theta/\partial\phi$	
PVPHR	$\partial v_\phi/\partial r$	
PVPHTH	$\partial v_\phi/\partial\theta$	
PVPHPH	$\partial v_\phi/\partial\phi$	

VSQ	$\|v\|^2$
V	$\|v\|$
PVTH	$\partial\|v\|/\partial\theta$
PVPH	$\partial\|v\|/\partial\phi$
PVR	$\partial\|v\|/\partial r$