

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

$$v_r = v_{r0} + \frac{1}{r^2 \sin \gamma} \frac{\partial \psi}{\partial \gamma}, \quad v_\theta = v_{\theta 0} + v_H \cos \alpha, \quad v_\phi = v_{\phi 0} + v_H \sin \alpha,$$

$v_H = -\frac{1}{r \sin \gamma} \frac{\partial \psi}{\partial r}$, where v_{r0} , $v_{\theta 0}$, and $v_{\phi 0}$ are given by a background wind model,

$$\psi = \sum_{i=1}^2 \frac{r_e^2 \sin^2 \gamma_i w_i h^2}{h_i^2 + h^2} (1 - e^{-\beta_i}) / 2,$$

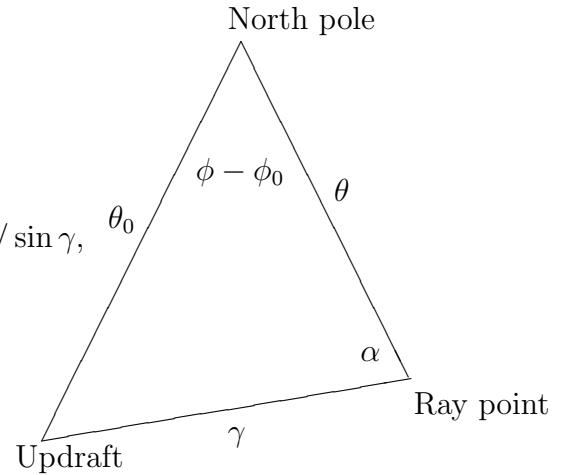
$$\beta_i = \frac{\sin^2 \gamma}{\sin^2 \gamma_i}, \quad h = r - r_e,$$

$$\cos \gamma = \sin \lambda_0 \cos \theta + \cos \lambda_0 \sin \theta \cos (\phi - \phi_0),$$

$$\cos \alpha = [\sin \theta \cos \theta_0 - \sin \theta_0 \cos \theta \cos (\phi - \phi_0)] / \sin \gamma,$$

$$\sin \alpha = \sin \theta_0 \sin (\phi - \phi_0) / \sin \gamma,$$

$$\theta_0 = \pi/2 - \lambda_0$$



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.

Specify—

the model check for VDRAFT = 1.0 (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)

OTHER MODELS REQUIRED: Any background velocity model.

Definitions:

FORTTRAN 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
EARTH	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	
VH	v_H	Horizontal component of wind velocity
	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	$\sin^2 \gamma$	
BETA1	$\beta_1 = \sin^2 \gamma / \sin^2 \gamma_1$	
BETA2	$\beta_2 = \sin^2 \gamma / \sin^2 \gamma_2$	
EXBET1	$e^{-\beta_1}$	
EXBET2	$e^{-\beta_2}$	
SUM1	$h_1^2 + h^2$	
SUM2	$h_2^2 + h^2$	
SUM1SQ	$(h_1^2 + h^2)^2$	
SUM2SQ	$(h_2^2 + h^2)^2$	
TEMP	$r_e^2 h \cos \gamma / r^2$	
VR1	$v_{r1} = r_e^2 h \cos \gamma / r^2 w_1 e^{-\beta_1} / (h_1^2 + h^2)$	
VR2	$v_{r2} = r_e^2 h \cos \gamma / r^2 w_2 e^{-\beta_2} / (h_2^2 + h^2)$	
VR	$v_r = (v_{r1} + v_{r2})h$	Vertical component of wind velocity
PVRR	$\partial v_r / \partial r$	
PVRR1	$\partial v_r / \partial r$	for updraft only
PVRR2	$\partial v_r / \partial r$	for downdraft only
SECGAM	$\sec \gamma$	
SGPGTH	$\sin \gamma \partial \gamma / \partial \theta$	
SGPGPH	$\sin \gamma \partial \gamma / \partial \phi$	
PVRG1	$1 / \sin \gamma \partial v_r / \partial \gamma$	for updraft only
PVRG2	$1 / \sin \gamma \partial v_r / \partial \gamma$	for downdraft only
PVRTH	$\partial v_r / \partial \theta$	
PVRPH	$\partial v_r / \partial \phi$	
TEMPB	$-r_e^2 / (r \sin \gamma)$	
TEMP1	$1 - e^{-\beta_1}$	
TEMP2	$1 - e^{-\beta_2}$	
VH1	v_{H1}	
VH2	v_{H2}	
VH	$v_H = (v_{H1} + v_{H2})h$	horizontal component of wind velocity
	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	$\cos^2 \alpha$	
VTH	v_θ	Southward component of wind velocity
VPH	v_ϕ	Eastward component of wind velocity
PVHR	$\partial v_H / \partial r$	

PVHR1	$\partial v_H / \partial r$	for updraft only
PVHR2	$\partial v_H / \partial r$	for downdraft only
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	$1 / \sin \gamma \partial v_H / \partial \gamma$	
PVHPG1	$1 / \sin \gamma \partial v_H / \partial \gamma$	for updraft only
PVHPG2	$1 / \sin \gamma \partial v_H / \partial \gamma$	for downdraft only
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	$\partial v / \partial r$	