The southerly jet along the Chilean coast and its relationship with the SCu cloud deck

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Surface wind maximum (jet) off Central Chile coast

QuikScat data, 1997-2003, 0.25°
...Jet is largely due to the strong southerly wind along the coast...

...little diurnal variations in zonal wind, somewhat stronger variations in meridional wind at lower latitudes...
Seasonal variation of Vmax

V(m/s) PM Mean DJF

V(m/s) PM Mean MAM

V(m/s) PM Mean JJA

V(m/s) PM Mean SON
Seasonal variation of PM-AM diff. in $V$
Seasonal variation of PM-AM diff. in U
MM5 simulation - October 2000
CIMAR-6

- Vertical grid spacing: 25 m
- Horizontal grid spacing: 45 km
- MBL param.: Gayno-Seaman
Height-latitude cross section at 73.5W

U
Easterly
J

V
J

W

T
J

35S 30S 25S
Height-longitude cross section at 29S
Jet dynamics

\[ \frac{1}{\rho} \frac{\partial p}{\partial x} + f \nu - \frac{C_d}{H} \bar{v} \]

\[ \frac{1}{\rho} \frac{\partial p}{\partial y} + \frac{C_d}{H} \nu |\bar{v}| \]

\[ -\frac{1}{\rho} \frac{\partial p}{\partial y} = \frac{C_d}{H} \nu^2 \]
Force balance at 312 m ASL

\[ \nu \frac{\partial v}{\partial t} \]

\[ \frac{1}{\rho} \frac{\partial p}{\partial y} \]

\[ -fu \]

\[ \nu \frac{\partial v}{\partial y} \]

\[ Fr \]
Synoptic variability (daily std):

North-south displacement of the Jet along the chilean coast (25-40S)
V controlled by dp/dy also seems to hold for synoptic-scale variability

10 and 22 UTC data – April–Nov. 2002

dSLP/dy ~ SLP(lat-0.5) – SLP(lat+0.5) [hPa] from MM5
Synoptic-scale variations in the southerly Jet associated with changes in the Sc deck

...Jet under clear skies...
Results from CIMAR-6 Modeling effort:
Two contrasting periods...

...Jet under clear skies...
However clear skies are due to Offshore-flow and subsidence
...and cloudy skies due to onshore-flow