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Orographic rainfall information

This study focuses on the need for a computational light model of orographic rainfall to support the assessment of rainfall in food-protected areas. Many of the drought-prone regions have complex terrains and limited data on the rain gauge. Afghanistan, Ethiopia, Central America and South Africa are witnessing a famine that has affected millions of people. Thus, we often know the least rainfall in many of the regions where it has the most direct impact on livelihoods. As rainfall and yields are closely linked in those drought-prone areas (Fig. 1), improvements in rainfall assessment will enable us to monitor, predict and mitigate hunger. In this book, we describe and validate a procedure for determining diagnostic precipitation obtained by Sinclair (1994, hereinafter referred to as S94) VDEL formula, extended by vertical speed calculations based on linear internal 2D gravitational waves (IGW). The Advanced Diagnostic Model (VDELB) was used to present orographic influences in 36-year-olds (1961-1996) Collaborating Historical African Rainfall Patterns (CHARM) (Funk et al. 2003). PRECIPITATION CHARM has an average absolute error of about 0.5 standard deviation. Seasonal totals correspond quite well to independent agroclimatic indicators, such as national maize production statistics (Fig. 1). This paper document provides a more complete evaluation process for VDELB and demonstrates its application for the determination of satellite rainfall (RSE) in South Africa. Improved RFE fields can provide earlier identification of regions that are potentially uncertain. The problem can be reshaped by comparing average rainfall from the National Centers for Environmental Prediction – National Center for Atmospheric Research (NCEP-NCAR) resuscitation (Kalnay et al. 1996) with high-quality interpolated data on the gauge of the independent slopes dataset (PRISM) (Daly et al. 1994) (Fig. 2). Ideally, a model could turn atmospheric data into rough-scale atmospheric fields in rainfall fields that look more like a real space-time distribution. Given sufficient resources, a built-in orographic model on a regional scale, such as Clark-Hall (Clark and Hall 1991; Clark et al. 1996), the Models of the Storm Analysis and Forecasts Centre (Xue et al. 2000, 2001), the Regional Atmospheric Modeling System (Pielke et al. 1992), or meteorological research and forecast (Michalakes et al. 2001) models can provide estimates of orographic rainfall. These fields can be used to improve interpolated rain surfaces or satellite rainfall estimates. 1992 (1993) or 1993 (1992) or 1994; Thornton et al. approaches can also be used in 2001. High calculations or demand for data make these approaches impractical on an operational basis, especially in or climatic scale scale especially in developing countries. This work explores the diagnostic approach, changing the calculations of VDEL (S94) at vertical speed induced by the terrain to include an internal approximation of a gravitational wave, increasing the applicability of the evaluator in many seasons and geographical areas. We call the modified model VDELB, where B shows navigability and second in series. The objectives of this document are 1) to better document the VDELB model used in our food security applications, (2) to present model validation in a data-rich area (Pacific Northwest) and 3) to show that the model can be used to improve satellite rainfall in South Africa. These results are presented in four sections that describe our motivation, methods, validation and application. Then we finish with a brief summary and discussion. Queney (1948), Scorer (1955) and Eliassen and Palm (1960) described linear gravitational waves in stratified streams above the orography. Smith's early research (1979, 1982) looked at greenhouse effects in a quasi-joseph framework. Carruthers and Choularton (1982) developed a model based on the linerized equation of heights. Hunt et al. (1988) and Carruthers and Hunt (1990) expanded this approach, which generated three unique solutions for lower, middle and upper layers of the atmosphere. Clarke and Peltier (1977, 1984), Peltier and Clark (1979), and Clarke and Farley (1984) noted the importance of waves. Duran (1986) used digital simulations to study amplification mechanisms in large amplitude mountain waves, which showed that when the parameter (N × mountain height/wind speed) is less than 0.3 and static stability has a two-layer structure, the non-linear response may differ significantly from the linear solution. When nonlinear waves are much larger than linear solutions, the highest stability is located at the lowest level, the flow resembles a hydraulic jump (Long 1935), and the wave of destruction can occur (Durran 1986, 1990, 1992). Although nonlinear effects are important, a recent study by Dornbrack and Nappo (1997) compared linear and nonlinear models in a number of realistic styles and essentially found similar results. In the real atmosphere, waves interact with each other, turbulence, and average flow in complex ways, but despite these difficulties, linear theory is still useful as a first-line assessment procedure that is easy to understand (Napo 2002). This property makes it a legitimate basis for diagnostic applications. Consider a two-dimensional Atmosphere Boussinesq, in which disturbances of atmospheric variables are independent and small compared to their background state. Under these conditions, linearized speed, mass and thermodynamic mixing equations can be combined to provide one expression for terrain-induced bursts at vertical speed. If the air with an average wind speed is schnoly, with heights, defined by the horizontal wave number k, such that h(x) = hm cos(kx), then the terrain-induced vertical interference rate (w′) will depend only on x and z, and the Taylor-Goldstein wave equation (Taylor 1931; Goldstein 1931; napo 2002) can be written as (Durran 1990, p. 62; Holton 1992, p. 1. The vertical structure of these waves will be determined by the dispersion relationship where m and k are the vertical and horizontal wave numbers. Since the flow of the boundary must be parallel to the surface, the following solutions can be extracted (Durran 1990): where m is calculated according to q. (5), and μ is calculated asThis correspond to evaporative and sinusoidal forms of vertically caught waves. This solution is limited in several important ways. Two-dimensional performance ignores important effects such as splitting and blocking the flow. We assume that the perturbines in the state fields are small and the linealized equations are adequate. This assumption can be disrupted, especially when dealing with large topographical obstacles, and is associated with several significant weather phenomena, such as air turbulence and trapping lee waves. The three-dimensional theory of linear perturbation (Smith 1980) suggests that unrealistic results are obtained when hNu-1 > 1, where h is the height of the mountain; the energy produced by gravitational waves under these conditions will exceed kinetic energy in the mountain, leading to the influx to avoid the obstacle. If N = 0,01 s-1 and = 10 m s-1, these criteria shall be exceeded when h > 1000 m. In these cases, the application of the model will be overestimated. Smith's three-dimensional formulation (1980) also predicted the tendency for the low flow level to split around the mountains, with the rate of spread spreading to the second sides of the wind and tides. These aspects of the flow along and around the complex terrain are not captured in the two-dimensional VDELB formula. If ∇ we assume that u ≈ us, then we can rewrite the original diagnostic equation for the orographic vertical movement [Eq. (1)]:Although this approximation is not accurate, it allows us to include some of the IGWs attributes in the VDEL. The atmospheric response will depend on whether N/us is less than k. We used NCEP-NCAR wind fields at the local height of the terrain to present us. , spread energy vertically into the atmosphere and can produce clouds or downstream from a function of the terrain. The typical values for us and N in the lower troposphere are about 101 m-1 and 10-2-2 s-1, respectively. Thus, at typical widths of the bland with an Lx greater than about 6000 m or values of k less than 10−3 s−1, the waves of the internal propagation of gravity will dominate. For the wide mountain limit, Kenny (1948) found that for a simple 2D idealized mountain, the terrain profile was reproduced on each integral of 2π(u/N). The vertical motion profiles associated with this wide mountain case will differ as a function of N and you. High winds and low stability will create sustained vertical movement at distances approaching the height of the troposphere scale, 7–8 km (Fig. 3). Low winds in stable conditions will create rapid transitions between upward and downward movements, with wavelengths of less than 1 km. Vertically decomposing evaporative solutions (not shown) are also included in the model. These VDELB vertical speed profiles are used in conjunction with the VDEL parameters of the relative humidity effects and theoretical conversion factor derived from the Clausius-Clapeyron equation and the first law of thermodynamics (Haltiner 1971). The resulting diagnostic connection is integrated from the surface to the tip of the ingating layer, accepted as 300 hPa. Please see S94 for more details. The terrain induced by the vertical speed obtained by Eq. (8) can be combined with large-scale vertical speeds: wt = wo + wl. In our research, we used vertical-speed profiles from the 4 times a day NCEP-NCAR reanalysing to represent 4 times a day NCEP-NCAR reanalysing. Initial tests with the VDELB model (described in section 4) show that the IGW parameter better represents the spatial and seasonal variability of precipitation. Both VDEL and VDELB, however, overestimate rainfall in all seasons. We corrected this by suggesting that opographic effects can only improve the existing weather system. This can be achieved by modifying the wing; This effectively limits orographic rainfall to days and places with large-scale rainfall. We call this limited model as VDELB*. It is important to note that the vertical speed of the reanales does not include mesoscale effects. In reanisms, it is obtained from solutions to primitive equations of wine, disvergence, virtual temperature, surface pressure logarithm and specific humidity of the T62 spectral network with 28 uneven cosmic sigma levels (Kantsu 1989; 1991; (1980); The average oversea elevations are also used in T62 resolution with an approximate resolution of 2°. Reanalysis does not include mesoscale orographical characteristics. The vertical speed of the surface is assumed to be zero, and the change of vertical speed in the sigma coordinates is calculated from the vertical scheme of Arakawa (1972). Equation a valid assumption is thus made that the large-scale deviation is independent of local terrain-induced vertical speed fields. Section 5 presents an application in South Africa that is used with realis, VDELB*, and satellite rainfall estimates. Here we briefly describe the technique of synthesis. Matching Filter Regression (MFR) is a statistical technique that combines multiple fields to create a single goal score. It borrows from remote reading the use of matching filters to isolate the desired signal (Stocker et al. 1990; 1997; Stocker and Schaum 1997; Villeneuve et al. 2001). MFR has been used by Hunger Early Warning Systems Network (FEWSNET) scientists to generate vintage water for satisfaction forecasts for South Africa for the 2002/03 season (Funk et al. 2002). MrF takes into account the following two factors: (1) the relationship between each prog. and purpose and (2) the convergence of evidence in the forecast factors themselves. In the first step, the predictors scale as an average of 0 and a deviation from r2, where each of them are located is a correlation of each of them with the observations. This weight gives better correlated fields more weight during the second step, in which the first main component (PC1) of forecasts is calculated. Since pc1 values will be high, where input materials covary, PC1 shows a convergence of evidence moderated by the strength of each input connection with the target (correlation). Then a two-boil regression is used to convert PC1 into rainfall estimates. If we allow r, v and s be vectors representing n = n = n = ncol × nrow), networked rainfall estimates based on NCAR-NCEP resuscitation (r), VDELB* model (v), and satellite precipitation fields (s), then we can describe the MFR process as Compliance (cr,o, cu,o, cs,o) means (r, v, s) and standard deviations (σr, σu, σs) are calculated on the basis of a subset of locations matching the stations. These values are used to create standardised fields in which the expected deviations will be equivalent to square correlations with gauge data [eq. (10)]. The first main component of these combined data sets [Eq. (11)] provides a weighted combination of r, v and s that can be converted linearly to assess the observed data [Eq. (12)]. The following section presents validation of the VDELB model in the Pacific Northwest. Section 5 then applies VDELB and MFR to improve rainfall forecasts in South Africa.This section describes the application of the VDELB model in a data-rich area - Pacific Northwest (Fig. 4, left panel). Three hundred and sixty-five days (1983) of the daily gauge monitoring (Fig. 4, right panel) were compared with the results of VDEL, VDELB and VDELB* evaluations. The station data was generously provided by P. Thornton and S. Running, who developed statistical interpolation models from the same region (Thornton et al. 1997). Data from the Cooperative Observatory of the National Service service and snowpack Telemetry (SNOTEL Network- Ministry of Agriculture of the Ministry of Agriculture for Soil Protection) were combined to provide over 1100 stations. The quality of the data was verified and the stations that missed more than 73 observations for 1983 (20% of 365 days) were dropped. This filter left 813 spatially well-distributed stations in the test area. To present the topography of the national geophysical data center with a 5-minute digital relief was used. Four times a day, temperature, specific humidity, wind speed, geopotential height and precipitation rate resuscitation data (Kalnay et al. 1996) are used to generate rainfall estimates. Atmospheric fields are at a 2.5° geographical grid and surface flows (precipitation) are strained to about 1,875° grid. Note that NCEP-NCAR does not include precipitation data in the realsis process, so the precipitation rate is a calculated variable. In 365 days in 1983, five different models were made for 8 km2, 6-hour resolution. VDEL has been tested at three different parameter settings: γ = (1.5, 1.0, 0.5). Because the γ controls the speed at which the terrain induced vertical speed breaks down, the decrease γ leads to an increase in the amount of rain. The constituent forms of VDELB and VDELB*, which are based on (8) and (9) respectively. The time series (Fig. 5) of the 365 days of observed gauges and IGW VDELB* for re-anealysis* reveal strong compliance levels on the regional scale, with a correlation of 0,88 and an average error of 0,2 mm day−1 (7% of the annual average of 3 mm-day 1). The overall skill [1 – (standard deviation of observations/standard deviation of observations) of VDELB* compared to the daily values of the station is significantly lower (0,47). Thus, the accuracy of the local/daily scale is very low. Figure 5 shows that the model tends to overestimate extreme events. In contrast to 3D representations (Smith 1980), VDEL and VDELB models cannot replicate the flow of separation or blocking and are thus likely to overestimate vertical speeds. Although the scale of heavy rainfall is overrated, their timing is surprisingly well represented. This result is not retained in the summer. when mesoscale convection will tend to produce small amounts of precipitation that are not caught either by reanialysis or by VDELB* models. The plots of the five models, averaged in winter, spring, summer and autumn season (Fig. 6) of 1983, show signs of a 2.5° imprint of the atmosphere of the realis. IgW-based VDELB does a better job of recreating the strong longitudinal gradients of rainfall found in this region and performs significantly better than the best VDEL average absolute error (MAE) of 2.8 versus 4.4 mm day−1. day−1. diagnostic procedures are difficult to recreate large-scale (synoptic/seasonal) volatility models. Limited VDELB* estimates are more accurate (MAE values of 1.8 mm day−1) and realistic (see for comparison the PRISM field in Fig. 2). By combining weather information from the reanalysis fields with local rainfall patterns that are caused by the terrain, the VDELB* model wisely recreates the spatial and temporal rainfall patterns in this area. The error network is created by subtracting every day's closest VDELB rating from the corresponding observation gauge. These daily error values are interpolated in the survey network and summed up to provide seasonal composites. On average for seasons, these sections provide estimates of the average biased error (Fig. 7). It is convincingly argued that the average absolute absolute error is a good statistic of the results of the model evaluation (Willmott et al. 1985); absolute error values are listed in Table 1. The three-dimensional theory suggests that separation will occur when hN/u > 1 and it turns out that the biggest faults in the VDELB* model may be related to relatively weak winds in relatively stable but humid conditions in the spring. Even the lowest MAE values in Table 1 are still very large compared to the average (e.g. annual VDELB* daily MAE of 1,8 mm day−1 is 60% of the annual average of 3 mm day − 1), but the station uncertainty estimates are unforgivable as the cancellation of errors resulting from spatial smoothing is not taken into account. The magnitude of the daily VDELB MAE, for example, compares favorably with the monthly MAE values of assisted interpolation (CAI; Wilmot and Robeson fields 1995) in south African regions , scattered at least data CAI rainfall fields are created by interpolating long-term climate anomalies and are general practice data produced by the Geography Department of the University of Delaware. Since the typical monthly MAE values above South Africa for the interpolated gauge data in January are about 30 mm month−1 (about 1 mm day−1), it is very likely that the VDELB model will be used to improve rainfall calculations, a topic that is discussed in more detail in the following section. In this test application, VDELB* estimates are combined with satellite and precipitation reanalysis fields using combined filter regression. Satellite RSE for Africa is mainly based on the length of time during which the cloud temperatures observed by the satellite remain above the temperature threshold. These estimates are routinely produced by the Climate Prediction Center (CPC; Xie and Arkin 1997, 1998; Herman et al. 1997) and Tropics applications of meteorology using satellite and other data (TAMSAT) group at the University of Read (Grimes et al. 1999). We combine the RFE SPC fields for one month (January 1997) with VDELB and precipitation resuscitations and use with global historical Network data (GHCN) (Peterson and Vose 1997) to prove that the combined agreed filter (MF) RFE is more accurate than just the RFE. Figure 9 shows the satellite RFE, the places of the gauge and the associated gauge – RFE scatterplot. Although the ratio between observed and expected precipitation is reasonable (r = 0,74), the mean absolute error (74 mm month-1) is very high: 49 % of the mean gauge values.Comparison with the precipitation fields of NCEP-NCAR reanalysis and VDELB* estimates reveal similar correlation levels (0,79 and 0,76 respectively). Although data limiting realism is rare in sub-Saharan Africa, it does a reasonable job of representing rainfall variability. A similar finding was presented in Funk et al. (2003), which showed that reanalysis data were able to accurately represent sub-time precipitation variability in Mali and Kenya. However, it seems that non-location within the resuscitation fields can create more false trends that need to be corrected by appropriate use of station data. In combination with the calculation of the MFR, correlations between the station and the fields of the RSE, the realise and the VDELB were used to obtain a better rainfall estimate (Fig. 10). Fusion increases correlation (0.84) and reduces MAE by 35% to 48 mm day − 1. It is better to reproduce a lot of heavy rainfall on the west coast of Madagascar. Lower rainfall levels over southern Mozambique seem more realistic, although no station data has been established in this region. Figure 11 shows a more detailed comparison of errors (estimated – observed). In some cases (A: eastern cape, B: central Madagascar and D: central Malawi), MF RFE overestimates rainfall by more than 100 mm. These areas are associated with steep gradients in topography (Fig. 12) and low altitude. Steep gradients make it likely that the linear assumptions of the IGW model will not be met, causing unrealistically strong atmospheric reactions. Since the height of these places is low, the effect of overestimated vertical terrain speeds can be increased, since bias can affect precipitation at all pressure levels. More efficiently coping with low altitude, high-altitude gradient places can improve the performance of the model. At higher altitudes (C: central Madagascar in Fig. 11), the inclusion of the oromial effects may improve rainfall forecasts. It is of interest that both the satellite and matching filter precipitation fields underestimate rainfall in Zambia and Zimbabwe (E in Fig. 11). The reason for this deviation is not clear, but it may be possible to use a more spatially explicit correction scheme. RSE satellites tend to dramatically overestimate rainfall in Congo and Saire (cases F and G), a problem mitigated by the MFR approach. atmospheric processes in the complex terrain, their computational weight will continue to hamper their application in large areas of space and time. The described and tested diagnostic model VDELB offers means to quickly approximate the effects of local terrain on large areas in mesoscale resolutions and daily steps of time. This model, or its improvements, can be used to present the subnet of orographical treatments in global weather forecast models, to improve satellite rainfall estimates or to improve interpolated gauge surfaces. We presented brief proof of concept that illustrates this point for a month in South Africa.The VDELB model adopts an atmosphere boussinesq and a linear solution to the equations of internal gravity wave. Linear assumption is associated with errors, especially in combination with large amplitude mountains. Although the VDEL model does not make this assumption, validation in the Northwest Ocean (Section 4) shows that the IGW extension improves performance while eliminating the need to set the parameter controlling the VDEL vertical speed profile. VDELB looks promising, but the linear assumption seems to be associated with a tendency to systematically overestimate heavy rainfall (Fig. 5), especially in regions with large mountains (Fig. 7; case B of Fig. 10 and 11). Steep gradients at low levels (cases A and D in Fig. 10 and 11) may also be overestimated.Comparison with GHCN data suggests that the model performance is reasonable in subtropical areas. Tropical areas are more problematic and significantly larger faults are found north of about 14° s. Just as the RFE and MF RFE fields tend to underestimate rainfall in zambia-Zimbabwe and underestimate rainfall in the Central and Eastern Democratic Republics Congo.In tropical regions, mesoscale convective processes will play a bigger role. Smith and Lynn (1982) discovered that the amplitude of thermally generated gravitational waves would normally equal or exceed the amplitude of terrain-induced waves (Nappo 2002). The current model does not constitute convection and therefore sub-predictive in the Congo-Saire basin. Explicit representation of convectively violent IGWs (Orville 1965, 1968; 2000) can improve the performance of models in tropical regimes. The current model can be applied in simpler tropical areas, such as Central America. Areas with complex mesoscale transversely, such as parts of equatorial East Africa, are likely to require approaches that are more complex. Preliminary modelling applications in Central Asia seem promising and potentially useful, given the extremely scarce data gap in this region. Several improvements to the VDELB model are likely to improve its effectiveness. One missing component is any treatment of moisture storage or rain-shadow effects. These improvements may reduce the Regions. The time effects associated with hydrometeor effects (Smith 2003) should also be added. The difficulties associated with linear assumption of the VDELB model can be mitigated by using the model at a rougher resolution (e.g. 25 km × 25 km), similar to global satellite precipitation products. The plausibility of using a complete model of 3D mountain wool should also be explored. The improved version of the model, with a better representation of tropical orographic effects, can be used effectively to improve these estimates of global rainfall. ConfessionsThis case was motivated and funded by the U.S. Famine Early Warning Agency through the International Program American Geological Survey USGS (Cooperative Agreement DOI 99CRAG0029). Chris Funk receives support from a Star Scholarship provided by the U.S. Environmental Protection Agency (U-915612-010). The ancient comments of our anonymous reviewers improved this manuscript significantly, as did suggestions provided by USGS scientists (Jim Verdin and Jim Rowland) and UCSB (Dar Roberts and Keith Clark). Previous work and discussions with the Climate Prediction Center (Jim Miller, Tim Love, Ping-Ping Si and Kevin Juss) and the Regional Remote Sensing Unit in Harare (Kennedy Masavu, Tinasé Mandaza, Tamuka Magajire) helped inspire these research efforts. Jim Verdin came up with the idea of using this orographic model as a means of increasing rainfall forecasts for food security applications. A. A. 1972. Design of ucla's general circulation model. A. 1972. Design of ucla's general circulation model. Department of Meteorology, University of California, Los Angeles Technology. fake Google Scholar SearchSelecting Quotes, M. Jay and W. T. Roach. 1977. Ographic rainfall in warm sectors of depression. Litre. - It's Roy. Meteor. 103:269–280.Barros, A. P., and D. P. Letermeyer. 1993. Dynamic modelling of the spatial distribution of rainfall in remote mountainous areas. - No, no, no, no, no, no, no, rev 121:1195–1214.Barros, A. P. and D. P. Letermeyer. 1993. Dynamic modelling of the spatial distribution of rainfall in remote mountainous areas. - No, no, no, no, no, no, no, no, 121:1195—1214.)| fakeSearch Google ScholarChoice citationBradulei, M.M. 1985. The digital simulation of the oral storms, Dr. Bradley, M.M. Numerical simulation of orographic storms, Dr. Dissertation, University of Illinois at Urbana, Champaign, 263 pp.)| falseSearch Google ScholarExport QuotesBrunje, R. T., , T. L. Clark, and C. D. Hall. 1994. Interactions between topographical airflow and cloud/precipitation development during a winter storm in Arizona. Atmos Atmos 51:48–67. Bruce, R. T., T. Clark and W. Hall. 1994. Interactions between topographical airflow and cloud/precipitation development during a winter storm in Arizona. Atmos, 51:48–67.)| fakeSearch google scholarExport quotingSimilar, D. and T. W. Choulton. 1982. Airflow on hills with a moderate slope. Litre. - It's Roy. Meteor. 108:603-624.Carthers, D.J., and Jay. C.R. Hunt. 1990: The role of mountain streams in cloud creation. Carthers, J.J. .C J. McN. Atmospheric processes of complex terrain, Meteor. Monogrove, 45, Meteor. 229–299.)| false Google Scholar Search East QuotesKker, T. L. and W. R. Peltier. 1977. The evolution and stability of the extreme amplitude mountain waves. Atmos T. T. Ščhi 34:1715–1730.Clark, L.L., and R. D. Farley. 1984. Heavy wind calculations in two and three spatial dimensions using aelastic interactive net nesting: Possible curvature mechanism. Atmos T. T. T. T. 41:329–350.Clark, L. and R. D. Farley. 1984. Heavy wind calculations in two and three spatial dimensions using aelastic interactive net nesting: Possible curvature mechanism. Atmos 41:329–350.)| false Google Scholar Search East QuotesKker, T. L. and W. R. Peltier. 1984: The critical impact of the level and resonant growth of the nonlinear mountain wave. 41:3122–3134.Clark, T. L. and W. R. Peltier. 1984: The critical impact of the level and resonant growth of the nonlinear mountain wave. Atmos. fake Google Scholar Search East QuotesKer, T. L. and W. D. Hall. 1991. Multi-domain simulations of the time dependent Navier Stokes equation: error analyses of nesting procedures benchmarks. J. Comput. Fizzle 92:456–481.Clark, L. L. and D. Hall. 1991. Multi-domain simulations of the time dependent Navier Stokes equation: error analyses of nesting procedures benchmarks. J. Comput. Wicks 92:456–481.)| falseSearch Google ScholarExport CitationClark, T. L., W. D. Hall, and J.L. Cohen. 1996. Source code documentation for the Clark-Hall cloud model: Code version G3CH01. Clark, T. L., W. D. Hall and L. Cohen. 1996. Source code documentation for the Clark-Hall cloud model: Code version G3CH01. NCAR Tech. Note. NCAR/TN-426+STR, 174 pp.)| fake Google Scholar SearchInsulation Citation, C. G. 1975. Presentation of the effect of topography on surface precipitation within moving baroclinical disturbances. Litre. - It's Roy. Meteor. 101:407–422.Collier, S. D. 1975. Presentation of the effect of topography on surface precipitation within moving baroclinical disturbances. Litre. - It's Roy. Meteor. Soc 101:407–422.)| fake Google Scholar SearchPort ationSport, W. R. and R. A. Anthes. 1989. Storm and cloud dynamics. L. Phillips. 1994 Statistical topographical model for mapping climatic rainfall on mountainous terrain. 33:140–158.Daly, K. P. Neilson and D. L. Phillips. 1994 Statistical topographical model for mapping climatic rainfall on mountainous terrain. G. Pris. fake Google ScholarExport search quotingDornbrac, A. and CJ. 1997 Note on the application of linear wave theory at critical level. Dornbrac, A. and C.J. Napo. 1997 Note on the application of linear wave theory at critical level. -Sloei meteor 82:399–416.)| false Search on Google ScholarExport quotingDruran, D. R. 1986. Another look at the Breham storms. Part I: For the development of analogues to a super-critical flow in an infinitely deep, continuously stratified liquid. Atmos Atmos 43:2527–2543.Duran, D. R. 1986. Another look at the Breham storms. Part I: For the development of analogues to a super-critical flow in an infinitely deep, continuously stratified liquid. J. Atmos. fake Google Scholar SearchPort quotingDruran, D.R. 1990. Mountain waves and winds. Durran, 1990 Mountain waves and winds. Atmospheric processes of complex terrain, Meteor. Monogrove, 45, Meteor. 59–81.)| false Search for Google ScholarExport cytosationDruran, D. R. 1992. Two layers of Long's solutions to vertical mountain wave propagation: How good is linear theory? Litre. - It's Roy. Meteor. 2018–1992. Two layers of Long's solutions to vertical mountain wave propagation: How good is linear theory? Litre. - It's Roy. Meteor. Soc 118:415–433.)| fake Google ScholarExport search cyrationS, A. and D. Palm. 1960. Wave energy transfer in stationary gravitational waves. Geophyses. 22:1–23.Funk, S., , J. Thaehler, D. Roberts, and C. Borel. 2001. Clustering to improve matching filter detection of weak gas drains in hyperspectral thermal imaging. IEEE Trans. 39:1410–1419.Funk, C, J. Tiller, D. Roberts and C. Borrell. 2001. Clustering to improve matching filter detection of weak gas drains in hyperspectral thermal imaging. IEEE Trans. Remote sensor 39:1410–1419.)| fake Google Scholar SearchAnnousions, C., , T. Magadazire, , G. Husak, , J. Verdin, , J. Michaelson, and J. Roland. 2002/2003 projections of maize cultivation conditions in South Africa based on October 2002 sea surface temperature and climatic fields. Funk, S., T., Magadazir, G. Husak, J. Verdin, Jay Michaelson and Jay Roland. 2002/2003 projections of maize cultivation conditions in South Africa based on October 2002 sea surface temperature and climatic fields. Special rep., 2 pp.)| falseSearch Google ScholarReslamations, C., , J. Michaelson, , J. Verdin, , G. Artan, , G. Husak, , G. Senay, , H. Gadin, and T. Magada. 2003. Cooperated historically African rainfall model: Description and evaluation. Tin. J. Klamatol 23:47–66.Funk, C, Michaelsen, J. Verdin, G. Arton, G. Husak, G. Zenai, H. Gadin, and T. Magada. 2003. Cooperated historically African rainfall model: Description and evaluation. Tin. J. Climatol 23:47–66.)| fake Search Google ScholarExport quotingGoldstein, S. 1931. For the stability of the oversimposed flows of liquids of Density. Proc. London A132:524–548.Grimes, D. I. F., , E. Pardo, and R. Bonifacio. 1999. Optimal rainfall assessment using raincoat and satellite date. 222:93–108.Grimes, D. I. F., E. Pardo, and R. Bonifacio. 1999. Optimal rainfall assessment using raincoat and satellite date. J. Hydrol 222:93–108.)| falseSearch Google ScholarExport CitationHerman, A., , V.B. Kumar, , P. A. Arkin and J. C. Kusky. 1997 Objectively defined 10-day rainfall estimates established for hunger early warning systems. Tin. J.B. 1997 Objectively defined 10-day rainfall estimates set up for hunger early warning systems. Tin. J. Climatol 18:147–164.)| fake Google Scholar SearchHichers, J. A., J. D. Istok, and A. L. Flint. 1992: Assessment of rainfall in mountainous terrain using geostatistics multivariate. Part I: Structural analysis. J. Pris. 1992: Assessment of rainfall in mountainous terrain using geostatistics multivariate. Part I: Structural analysis. G. Pris. fake Google Scholar SearchHism, J. A., A. L. Flint, and J. D. Istok. 1992: Assessment of rainfall in mountainous terrain using geostatistics multivariate. Part II: Isohyetal maps. J. Pris. 1992: Assessment of rainfall in mountainous terrain using geostatistics multivariate. Part II: Isohyetal maps. G. Pris. false search on Google ScholarExport quotehill, F. F. 1983. The use of average annual rainfall to get estimates of the increased frontal rain over England and Wales for different wind directions. J. Chilimatol 3:113–129.Hill, F. F. 1983. The use of average annual rainfall to get estimates of the increased frontal rain over England and Wales for different wind directions. J. Climatol 3:113–129.)| fake Google ScholarExport CythationHolton Search, J. R. 1992. Introduction to dynamic meteorology. 3d ed. . Hunt, J.C. 1988. A storm running through the hills. Litre. - It's Roy. Meteor. 1435–1470. Calne, E. Coaton, 1996. 40 years of resuscitation. Bull. Meteor. T.2.1.1.1989 Description of NMC Global Data Assimilation and Forecast System. - No, no, no, no, no, Prediction 4:335–342.Kanamatsu, M. Co-authors 1991. The latest changes introduced in the NMC Global Forecast System. - No, no, no, no, no, Prediction 6:425–435.Kyriakidis, P.C., J. Kim, and N. L. Miller. 2001. Geopolitical mapping of rainfall data using atmospheric and terrain characteristics. 40:1855–1877.Kyriakidis, P.C., Jay Kim and N. L. Miller. 2001. Geopolitical mapping of rainfall data using atmospheric and terrain characteristics. J. Pris. fake Google Search Woolworths quotedLong, R. 1953. Some aspects of the flow of stratified liquids, I: Theoretical investigation. T.5:42-58.Mihalakes, J., S. Chen, , J. Dudha, L. Hart, J. 2001. Development of a regional exploration and forecasting model of the next generation. Mihalakes, Jay, S. Chen, Jay Dudia, L. Hart, Jay Klemp and Jay Middlekoff. 2001. Development of a regional exploration and forecasting model of the next generation. Development in Terrafluth: 9th ECMWF Workshop for the Use of High Performance Computing in Meteorology, Walter Zviflofer and Norbert Creutz, Eds., World Scientific, 269–276.)| fake Google ScholarSports Search Quotel, C. J. 2002. Introduction to atmospheric gravitational waves. -Orville, H. D. 1965. A numerical study of the initiation of clusters of clouds over mountainous terrain. 22:684–689.Orville, H. D. 1968. The impacts of the wind environment on the initiation and development of cluster clouds over the mountains. L. Clark. 1979. Evolution and stability of extreme amplitude mountain waves: Part 2: Surface resistance and observed storms. Atmos Atmos 36:1498–1529.Peltier, W. R. and T. L. Clark. 1979. Evolution and stability of extreme amplitude mountain waves: Part 2: Surface resistance and observed storms. Atmos. fake Search quotes from Google ScholarExportSing, T.C and R. S. Fosse. 1997 Review of the temperature database for the global historical climatology network. Bull. Meteor. T.2.2837–2849.Peterson, p. 1. C. and R. S. Asse. 1997 Review of the temperature database for the global historical climatology network. Bull. Meteor. Soc 78:2837–2849.)| fake Google Search Woolworths quotes Pielke, R. A. Couathors 1992. Overall meteorological modeling – RAMS. Meteor. Atmos, 49:69–91, Kuni, 1948. The problem of airflow over the mountains: A summary of theoretical studies. Bull. Meteor. 29:16–25.Rhea, J. O. 1978. Orographical rainfall model for hydrometeorological use. .Rhea, J. O. 1978. Orographical rainfall model for hydrometeorological use. Colorado State University, 278, 198 p.)| fake Search on Google ScholarExport QuoteSaid, R.S. 1955. Air flow theory over the mountains, Part 4: Separation of flow. Litre. - It's Roy. Meteor. 81:340–350.Sella, J. D. 1980. Spectral modeling at the National Meteorological Center. - No, no, no, no, no, no, no, since 1994, diagnostic model for assessing oily rainfall. 33:1163–1175.Smith, R.B. 1979. Atmos Atmos 36:2385–2393.Smith, R.B. 1980. Linear theory of stratified hydrostatic flow along an isolated mountain. 1982: .B observations and theory of asexual wind and pressure. Atmos Atmos 39:60–70.Smith, R.B. 2003. Linear orographic rainfall pattern. Ga. Hydrol 282:2–9.Smith, R.B., and Y-L. Lynn, 1982. The addition of heat to an air stratified flow with application to the dynamics of the orographic rain. Litre. - It's Roy. Meteor. 108:353–378.Smith, R.B. and U.L. Lynn, 1982. The addition of heat to an air stratified flow with application to the dynamics of the orographic rain. Litre. - It's Roy. Meteor. Soc 108:353–378.)| fake Google ScholarExport citationStocker, A. D. and A. P. SCHAUM search. 1997. Application of centa mystical mixing models in hyperspectral detection problems. -Stoker, A. D. and A. Shatum. 1997. Application of centa mystical mixing models in hyperspectral detection problems. Algorithms for multispectral and hyperspectral imaging III, A. E. Iverson and S. S. Shen, Eds., SPIE International Society for Optical Engineering, Proc. Vol. 3071, 47–60.)| falseSearch Google ScholarExport CitationStocker, A. D., I. S. Reed, and X. Yu. 1990. Processing of multidimensional signals for detection of electro-optical purposes. -Soker, L.D., Reed and X U. 1990. Processing of multidimensional signals for detection of electro-optical purposes. Signal and data processing for small targets, O. Drummond, Ed, SPIE, 218–231.)| FakeSearch Google ScholarExport Readers, D. I. 1931. Effect of variation in density on the stability of overseed liquid streams. Proc. London A201:499–523.Taylor, G. I. 1931. Effect of variation in density on the stability of overseed liquid streams. Proc. London A201:499–523.)| falseSearch ScholarInsulation citation Thompson, C. S., , M. R. Sinclair, and W. R. Gray. 1997. Assessment of long-term annual boiling in a mountainous region by diagnostic model. Tin. Ga. 1997. Assessment of long-term annual boiling in a mountainous region by diagnostic model. Tin. J. Climatol 17:997–1007.)| falseSearch Google ScholarExport Citation Thornton, P. E., S. W. Running, and M. A. White. 1997 Creation of surfaces of daily meteorological variables on large areas of complex terrain. J. Hydrol 190:214–250.Thornton, P. E., S. W. Running, and M. A. White. 1997 Creation of surfaces of daily meteorological variables on large areas of complex terrain. J. Hydrol 190:214–250.)| falseSearch Google ScholarSelect quotes, T.M., C. H. Chen, and C. I. Chang. 1997. A rear smallest squares orthogonal subspace projection approach to the desired extraction and detection of signature. IEEE Trans. Remote Sens 35:127–139.Tu, T.M., H. H. Chen and Chang. 1997. A rear smallest squares orthogonal subspace projection approach to the desired extraction and detection of signature. IEEE Trans. Remote sensation 35:127–139.)| falseSearch Google ScholarExport CitationVilleneuve, P. V., , H. A. Fry, , J. P. Theiler, B. W. Smith, and A. D. Stocker. 1999 Improved techniques for detecting matching filteres. Villeneuve, P. V., H. A. Fry, J.P. Thayler, B. W. and A. D. Soker. 1999 Improved techniques for detecting matching filteres. Imaging Spectrometry V, M. R. Descour and S. S. Shen, Eds., International Society for Optical Engineering, Proc. SPIE Vol. 3753, 278–285.)| Fake Google Scholar SearchSelecting Cytonapors Williams, CJ and S.M. Robeson. 1995. Climatologically assisted interpolation (CAI) of terrestrial air temperature. Tin. J. Kleimathol 15:221–229.Wilmot, K. Y. and S.M. Robeson. 1995. Climatologically assisted interpolation (CAI) of terrestrial air temperature. Tin. fake Search authenticated quotes on GoogleWillmott, C. J. Coauthors 1985. Statistics for evaluation and comparison of models. Geophyses. 2000 2000 2000 2000 2000 2000 700 700 1999.00 2005 2000 2000 2000 2000.2000 The impact of internal gravitational waves on convection and clouds in a lower atmosphere. Weissogrodsky, A. A. 2000. The influence of internal gravitational waves on convection and clouds in a lower atmosphere. Preliminary prints, 13th Int. 518–521.)| fake Search Google ScholarExport Quoteex, P. and P. A. Arkin. 1997. Global rainfall: 17-year monthly analysis based on gauge monitoring, satellite ratings and numerical outputs from the model. Bull. Meteor. 78:2539–2558.Xi, P. and P. A. Arkin. 1997. Global rainfall: 17-year monthly analysis based on gauge monitoring, satellite ratings and numerical outputs from the model. Bull. Meteor. Soc 78:2539–2558.)| fake Search Google ScholarExport Quote