

NMM25

5 – 8 september 2006 i Uppsala

Abstract

I denna lista (i författarbokstavsordning) finns abstract som kommit till NMM-kommittén fram till 1 september.

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Hur fungerar växthuseffekten?

Professor Lennart Bengtsson

Vattenånga, koldioxid, metan osv. tillsammans med ozon spelar en central roll för atmosfärens strålnings- och värmebalans. Detta har mer eller mindre varit känt sedan mitten av 1800-talet. En förhöjd koncentration av dessa gaser innebär en ytterligare temperaturhöjning vid jordytan och i troposfären (men avkylning i stratosfären). Den globala temperaturförändringen under de senaste 30 åren är i överensstämmelse med ökningen av de antropogena växthusgaserna. Andra orsaker till den globala temperaturhöjningen (mer eller mindre obestyrkta) kan med vår nuvarande kunskap uteslutas.

Den omedelbara effekten av en fördubbling av växthusgaserna innebär vid jämvikt en temperaturhöjning på ca 1C. Denna jämvikt fördröjs av havens enorma värmekapacitet och den totala värmeeffekten har därför ännu inte fått sitt fulla genomslag. Den direkta växthuseffekten förstärks vidare med en faktor på 2-4 genom ökad vattenånga (effekt av högre temperatur), reducerat albedo (mindre reflektion mot jordytan) samt mindre molnavkylning. Största osäkerheten beror på molneffekten men samtliga klimatmodeller som studerats i samband med IPCC 4e utvärdering (publiceras nästa år) ger alla ett positivt bidrag från moln (huvudsakligen genom reduktion av stratiforma moln i tropikerna). Överlagrat på en långsam uppvärmning finns kaotiska variationer på kortare och längre tidsskalor, vilka har en stor regional effekt. Följaktligen kan växthusuppvärmningen maskeras alternativt förstärkas under längre tid, men huvudsakligen regionalt. Aerosoler i atmosfären (som kan ha både en positiv och negativ effekt) innebär en ökad komplexitet, liksom den globala kolcykeln. De allra senaste modellberäkningarna ger dock på längre sikt en positiv återverkan av kolcykeln, dvs atmosfärens koldioxidhalt förväntas stiga ytterligare genom reducerade nettoackumulation i hav och vegetation..

Varför blir vissa vintrar kallare än andra?

Professor Lennart Bengtsson

Klimatet karaktäriseras i de flesta områden av stora variationer. Inte minst gäller detta det nordeuropeiska området. Skillnaden mellan en kall januari (1942) och en mild januari (1930) i Uppsala t ex uppgår till 67% av årsamplituden. En central fråga för klimatforskningen är att förstå orsaken härtill. Ett typiskt mediasvar kan lyda så att detta beror på intensiteten i

västvindcirkulationen eller (NAO) North Atlantic Oscillation, med hopp om att utfrågaren inte kommer med följdfrågan om varför varierar då NAO? Vad är orsaken härtill?

I en nylig artikel i *Climate Dynamics*, som jag kommer att beskriva, har jag och mina medarbetare visat att klimatväxlingarna i Europa under tiden 1500-1900 helt dominerades av interna kaotiska processer och egentligen inte orsakades av någon speciell extern effekt. Den kalla vintern 1941-42 kan alltså hända igen (utan någon extern effekt) även om den bör mildras med 0.5-1C växthusuppvärmning. Av samma orsak kan vi förvänta oss att en extrem varm årstid blir något varmare. *Frågan i rubriken har därför inget egentligt svar.* Klimatet har en intern variabilitet som med största sannolikhet inte är prognoserbar, åtminstone inte från ett år till ett annat och knappast med någon större noggrannhet från en månad till nästa. Det är denna höga variabilitet som är orsaken till det nordiska klimatets robusthet och en garanti att vi sannolikt behöver oroa oss mindre för växthuseffekten än andra mer utsatta nationer.

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Nya svenska vindkarteringen

Hans Bergström

Uppsala universitet, Institutionen för geovetenskaper-meteorologi

För att optimalt kunna utnyttja vinden som förnyelsebar energikälla måste god kunskap finnas om vindarna på 50-150 m höjd. En metod att beräkna vindklimatet på dessa höjder har utvecklats vid Uppsala universitet. MIUU-modellen, en s.k. 'higher-order closure' mesoskalemodell, används för att beräkna vindpotentialen över hela Sverige med 1 km horisontell upplösning. Kartläggningen sker inom ramen för Energimyndighetens projekt 'Kartläggning av vindpotentialen i Sverige'.

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Molnregimer i tropikerna

Salomon Eliasson

A study of the statistical characteristics of convective storms in a monsoon regime in Darwin, northern Australia, has been conducted with the use of radar. Enhanced knowledge of tropical convection is essential in studies of the global climate, and this study aims to bring light on some special characteristics of storms in a tropical environment. The observed behaviour of convective storms can be implemented in the parameterisation of these in cloud-resolving regional and global models. The wet season was subdivided into three regimes; build-up and breaks, the monsoon and the dry monsoon. Using a cell tracking system called TITAN, these regimes were shown to support different storm characteristics in terms of their temporal, spatial and height distributions. The build-up and break storms were seen to be more vigorous and particularly modulated diurnally by sea breezes. The monsoon was dominated by frequent but less intense and vertically less extensive convective cores. The explanation for this could be found in the atmospheric environment, with monsoonal convection having oceanic origins together with a mean upward motion of air through the depth of the troposphere. The dry monsoon was characterised by suppressed convection due to the presence of dry mid-level air. The effects of wind shear on convective line orientations were examined. The results show a diurnal evolution from low-level shear parallel orientations of convective lines to low-level shear perpendicular during build-up and breaks. The monsoon was dominated by complex orientations of convective lines.

The thesis includes a study of merged and splitted cells, which have been separated from other storms, and mergers were shown to support more vigorous convection in terms of height distribution and reflectivity profiles. They were also seen to be the most long-lived category of storms as well as the most common type. Split storms were generally weaker, indicative of their general tendency to decay shortly after the split occurred.

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Military Oceanography in Sweden

Gustav Grandin METOCC, Enköping

In the Swedish Armed Forces we are now rebuilding our activities and knowledge in military oceanography. From this year, 2006, we have organised a small military group in METOCC for oceanography where we plan to run a system with daily distribution, processing, storing and presentation of military oceanographic data. But it will take more than two years to bring this system in full operational use. In this process we have studied oceanographic activities abroad, for example in Norway and UK.

However, we have already made some experiments with oceanographic data during exercises in the Swedish Navy. We have then made tests with forecasts of sound velocity profiles and sonar (acoustic) ranges. These forecasts have been received from the Swedish operational model HIROMB and a military tactical decision aid, named COMBIS (developed at FOI). At the experiments we have compared the forecast data with the measured data from submarines, corvettes and helicopters. We have then found that HIROMB has to be improved in many ways. But HIROMB has given better results since a data assimilation scheme was introduced last November. Also we have studied different types of visualisations from COMBIS e.g. cross sections of sound velocities and sonar ranges.

For the future we want more real-time observations from buoys, ships (bathy) and helicopters. For that we need a military data base. Also we want improved oceanographic models, for example high-resolution models for limited areas. To realize that we are now increasing our cooperation with different partners both in Sweden (FOI, SMHI and the universities) and in other countries. International cooperation in oceanography is more and more important also because of the increased international activities in the Swedish Navy.

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Extreme winds in arctic waters

By *Sigbjørn Grønås*, Department of Geophysics, University of Bergen

A few observations and many ship accidents indicate that winds might become very strong in Arctic. An example is gusts of 163 knots measured at Jan Mayen 9. April in 1933, which some claims to be the strongest wind ever measured on the earth at a standard meteorological surface station (Lamb 1991). Another example is a well documented ship accident 4. April 1952 south of Jan Mayen when 5 Norwegian vessels went down in hurricane force winds, and 79 seal hunters lost their life.

However, analyses of extreme winds based on observations do not show stronger winds in Arctic than at mid-latitudes (Norwegian investigations connected to future oil/gass activity in Barents Sea). On the

contrary, a similar extreme analysis based on ERA40 reanalyses shows a marked weakening of extreme winds from areas south of the Icelandic Low towards the Barents Sea (Song 2006). Is there a contradiction between the examples mentioned above and extreme analyses of winds?

Strong winds in Arctic waters are connected to polar lows, arctic fronts and/or topographical effects. Polar lows are well known (Rasmussen & Turner 2003), arctic fronts and topographical effects are less investigated (Grønås & Skeie, 1999; Skeie & Grønås 1999). Arctic fronts are created at the ice edge by differential heating over ice and sea (Økland 1998). They are very common and strengthen the wind north and west of both normal extratropical lows and polar lows in the Nordic and Barents Seas. Topographical effects become especially strong when stably stratified air over the ice is forced over topography like the mountains of Spitsbergen (Skeie & Grønås 1999).

The resolution in reanalyses is too coarse to describe polar lows, arctic fronts and mesoscale topography. An increase in resolution to a grid mesh around 50 km in a control run with an atmospheric climate model gives improvements in this respect, in particular related to mountain effects such as barrier winds east of Greenland and left side jets connected to the Stad corner of southern Norway (Barstad & Grønås 2005; 2006). However, a marked decrease in extreme wind speed towards Arctic is still present (Song 2006). Even higher resolution is necessary for proper description of the mentioned arctic weather phenomena. Case studies show that simulations with 10 km grid length or less in numerical weather prediction models might give good descriptions of polar lows, arctic fronts and mesoscale mountain effects (Grønås et al. 2003; Grønås & Skeie 1999; Skeie & Grønås 1999).

The small scale of important arctic weather phenomena and few observations introduce problems in doing extreme analysis of winds in the area. The few long observation series available are often from islands with topography that might both strengthen and reduce the wind speed. The wind at Bear Island, for instance, is probably weaker than over surrounding sea. A downscaling of ERA40, using a model with a grid size of 10 km or less, will be needed for better estimates of extreme winds in Arctic. Further investigation of extreme weather in the area is planned to take place the International Polar Year 2008.

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Klimatkommunikation

Pär Holmgren

Klimatet på vår planet förändras. Det tror jag vi alla kan vara överens om. Vi kan diskutera följderna och orsakerna, och förhoppningsvis kan vi även diskutera vad vi ska och kan göra för att minska riskerna med det som är på väg att hända.

Även om vi är naturvetare och kanske först ser klimatfrågan som en naturvetenskaplig frågeställning får vi inte glömma bort att följderna av ett förändrat klimat i högsta grad är en humanitär fråga. Det handlar dels om rättvisa mellan alla människor på jorden, men även i ett snävare och mer egoistiskt perspektiv här hemma i Norden om rättvisa gentemot våra barn, barnbarn, barnbarnsbarn och kommande generationer – oavsett om vi får träffa dem öga mot öga eller inte.

Vi meteorologer kan spela en viktig roll i klimatfrågan om vi vill det. Det svenska Naturvårdsverket fick under 2005 mycket beröm från EU för att de använt TV-meteorologer i sin informationskampanj. EU vill nu att övriga länder gör likadant. Framförallt Martin Hedberg och John Pohlman, men även jag själv, har ”utnyttjats”.

Men det är många av oss som åtminstone ibland har kontakt med massmedia, och säkert då och då får frågor om extrema väderhändelser och annat. ”Beror det här på växthuseffekten?” Dum fråga, tänker du kanske och svarar det duktigt inlärd: ”Nej, man kan aldrig koppla ihop en enskild väderhändelse med klimatförändringen. Det hade kunnat ske ändå.” Reportern följer då upp med: ”Men visst har det blivit blåsigare under senare år?” eller kanske ”Men visst var det mer snö när jag var liten?” och du svarar kanske något om att det inte går att uttala sig säkert eftersom det är så korta mätserier och de naturliga variationerna på en viss plats är så stora.

Det är så klart viktigt att dina kollegor håller med dig, och kanske får du även beröm efteråt för att du svarade så vetenskapligt korrekt på de ovetenskapliga frågorna. Kanske blir det även en diskussion om att journalister drar förhastade slutsatser, överdriver och skyller minsann allting nu för tiden på växthuseffekten. Känner du igen dig? Alltför många akademiker, vetenskapsmän, specialister som får frågor om sitt specialområde svarar med ett ordval som oftast är riktat till sina kollegor. Det är viktigare att svara vetenskapligt korrekt än att de som i slutändan läser, hör eller ser intervjun verkligen förstår innebörden av svaret.

Tänk igenom innan intervjun vad du vill skicka med för budskap! Sätt dig in i vilket sammanhang som intervjun kommer att publiceras. Vilken målgrupp är det som du egentligen talar till? Se till att du får svara på de frågor som DU vill svara på, de frågor som du tycker att reportern borde ha ställt! Även om hon eller han av någon anledning inte frågar dig det. ”Beror det här på växthuseffekten?” behöver inte besvaras med ett kanske vetenskapligt riktigt ”nej”. Man kan kanske lika korrekt svara exempelvis: ”Ja, det finns en risk att det här blir vanligare i framtiden.” Då får ni dessutom antagligen betydligt viktigare och intressantare följdfrågor om vad det beror på och vad vi kan göra åt det.

Och i det läget hamnar ni en valsituation igen. Nu kan du antingen svara något vagt om att ”man” borde minska utsläppen av växthusgaser (åtminstone i ett globalt perspektiv). Eller så svarar ni raskt, och med bara lite glimt i det ena ögat: ”Höj bensinpriset till minst 100 kr litern!” Gör ni det senare kan jag av personlig erfarenhet garantera att ni får ännu intressantare följdfrågor och dessutom antagligen ännu större utrymme i massmedia! Och när det gäller klimatfrågan kanske just det kan vara både rätt och riktigt och viktigt. Tydlig kommunikation, som går igenom det enorma informationsbruset, är viktig!

Varningstjänst för kraftiga flöden och översvämningar i Venezuela. Vargas – ett EU-hjälp-projekt i Venezuela

Caje Jacobsson och Miguel Portal
SMHI

Bakgrund Ett förfärligt oväder i dec 1999 gav 200mm regn i början av dec och 2 veckor senare kom uppskattningsvis 900mm inom 3 dygn. Höga branta berg gjorde att det blev stora jord- och stenskred som tillsammans med vatten (som blöt cement) drabbade husen på kustremsan nedanför. 10 000-tals människor dog.

Projekt För att förebygga att framtida kraftiga oväder skall ge liknande stora naturkatastrofer bildades ett projekt för att skapa en varningstjänst mot denna typ av naturkatastrofer. Detta projekt består av en mängd mindre projekt. Det gäller att bygga hinder mot liknande naturkatastrofer, kunna förvarna, när kraftiga oväder är på gång och snabbt ordna utrymning av utsatta farliga områden. Projektet stöds av Venezuelanska regeringen och även av FN. Mycket frivilligt arbete pågår inom Venezuela. Här gäller samordning, hänsyn och att lyssna till befolkningen.

Eptisa International, är ett spanskt företag, som driver detta projekt enligt FN:s definition: ”Human development” och inte bara se till det tekniska. Man vill vara en aktör med ansvar och respekt för mottagarna.

På plats i Vargas är det företaget CorpoVargas, som är samordnare för de berörda instanserna vid en eventuell vädervarning.

Experter SMHI-tjänstemän har kopplats in som experter. Tidigare har hydrologer varit i Venezuela, kartlagt floder, terräng och föreslagit placering av observationsstationer, hydrologiska och meteorologiska.

Mission 3 I denna mission deltog vi. Här gäller det att bygga upp en varningscentral, som kan skicka ut vädervarningar, SAT (Sistema de Alerta Temprana = Early warning system), när det bildas regnväder, som kan ge stora skador på naturen med ras och översvämningar som följd.

I detta område med mäktiga bergskedjor och nära havskusten bildas långvariga nederbördsområden, som tidvis ger rikligt med regn. Nederbörden bildas i samband med frontsystem, påverkan av orografin och den intertropiska konvergenzonen. I dessa utsatta områden bor också många fattiga människor med dåliga bostäder, som inte klarar jordras.

I Venezuela har senaste året bildats en vädercentral för varningstjänst. Den drivs av militären och är under utveckling. Universitetet har i samband med detta projekt börjat se sig om efter lämpliga prognosmodeller från andra länder. Det blev vår uppgift att finna modeller, förklara dem och finna lämpliga produkter från dessa modeller. Vi diskuterade de amerikanska modellerna MM5, GFS och ETA. Vi verifierade testkörningar från den amerikanska MM5 modellen, som kördes för Venezuela området. Svagheter definierades och modellens förmåga att prognosera vädret i tropikerna bedömdes. Syftet var bl.a. att väcka diskussion

och bedöma modellens tillförlitlighet. Resultatet av verifieringen visar att på höga nivåer stämmer modellerna bra, men på låga nivåer är det sämre p.g.a. orografien. Slutsatsen blev att MM5 ändå kan rekommenderas för prognosverksamheten i Venezuela.

I Venezuela har man också installerat en del automatiska markobservations-system (Vaisala), 8 st doppler radar (Gematron) och blixlokaliseringssystem (Vaisala). Vår uppgift blev här att förklara produkter från fjärranalyssystemen inkl satellitbilder från GOES. Speciellt intresse ägnades tolkning och användning av radarbilder.

Universitetet ämnar bygga upp en prognosavdelning för test att utfärda SAT, Systema Alerta de Temprana (Early warning system). Det kommer att ligga i samband med utbildningen av blivande meteorolog-hydrolog-tekniker. Här blev också vår uppgift att föreslå ett undervisningsprogram och uppbyggnad av en tillfällig prognoscentral.

Vi samarbetade också med IMF (Instituto de Mecánica de Fluidos), som utvecklat tillsammans med japanska meteorologer/hydrologer ett varningsprogram för översvämning med utgångspunkt från observationer inom ett testområde med ca 20 observationsplatser, Cuenca Experimental de San José de Galipán.

Slutsats Under helt andra förutsättningar än vi är vana vid i vårt land, har man i Venezuela påbörjat denna uppbyggnad av en varningstjänst. Det är inte bristen på pengar att köpa utrustning utan det är svårigheten att samarbeta, att lita på varandra, att dela med sig av sin kunskap och sina observationsdata samt att få sina observationssystem att fungera och att skydda dem mot stöld. Med SMHI som förebild kan det vara lätt för oss att föreslå att de skall utveckla en institution, där grundprognoser skapas och som sedan utnyttjas vid de lokala vädercentralerna. Men detta land är kanske inte moget för detta ännu. Vårt förslag blev därför vilken grundinformation, som behövs för att kunna utfärda för landet lämpliga varningsprognoser anpassade i tid och rum efter deras situation vad gäller väder, tillgång till personal och kommunikationsmöjligheter.

Evaluation of Rossby Centre cloud simulations using satellite-retrieved cloud information

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A satellite-derived (NOAA AVHRR) cloud climatology over the Scandinavian region covering the period 1991-2001 has been used to evaluate the performance of cloud simulations of the SMHI Rossby Centre regional climate simulation model (RCA3). The cloud parameters studied were the fractional total cloud cover, the vertical distribution of clouds and the optical thickness of clouds.

Several methods of adapting the satellite and model datasets to allow a meaningful comparison were applied. In particular, a method to filter out optically very thin clouds from the model simulation dataset was utilised to account for cloud detection limitations of the satellite retrieval method.

Validation results show that RCA3-simulated average total cloud cover for the entire ten-year period agrees within a few percent with the satellite-retrieved cloud amounts on seasonal and annual time scales for results based on the Maximum and Maximum-Random cloud overlap approaches. Results for Random overlap showed generally higher cloud amounts than the satellite. Regarding the seasonal cycle of cloudiness RCA3 appeared to underestimate the yearly amplitude indicated by the SCANDIA climatology. Figure 1 shows the corresponding results for seasonal cloud amounts from SCANDIA, RCA3 before filtering and RCA3 after filtering the model data set for the case using the Maximum cloud overlap approach.

A substantial imbalance between the respective RCA3 contributions from low-, medium- and high-level clouds was seen for all cloud overlaps. For Maximum overlap, which is the cloud overlap used in the RCA3 radiation scheme, the differences from satellite-derived contributions were +2.4 % for high-level clouds, -5.2 % for medium-level clouds and +4.0 % for low-level clouds regarding the averaged

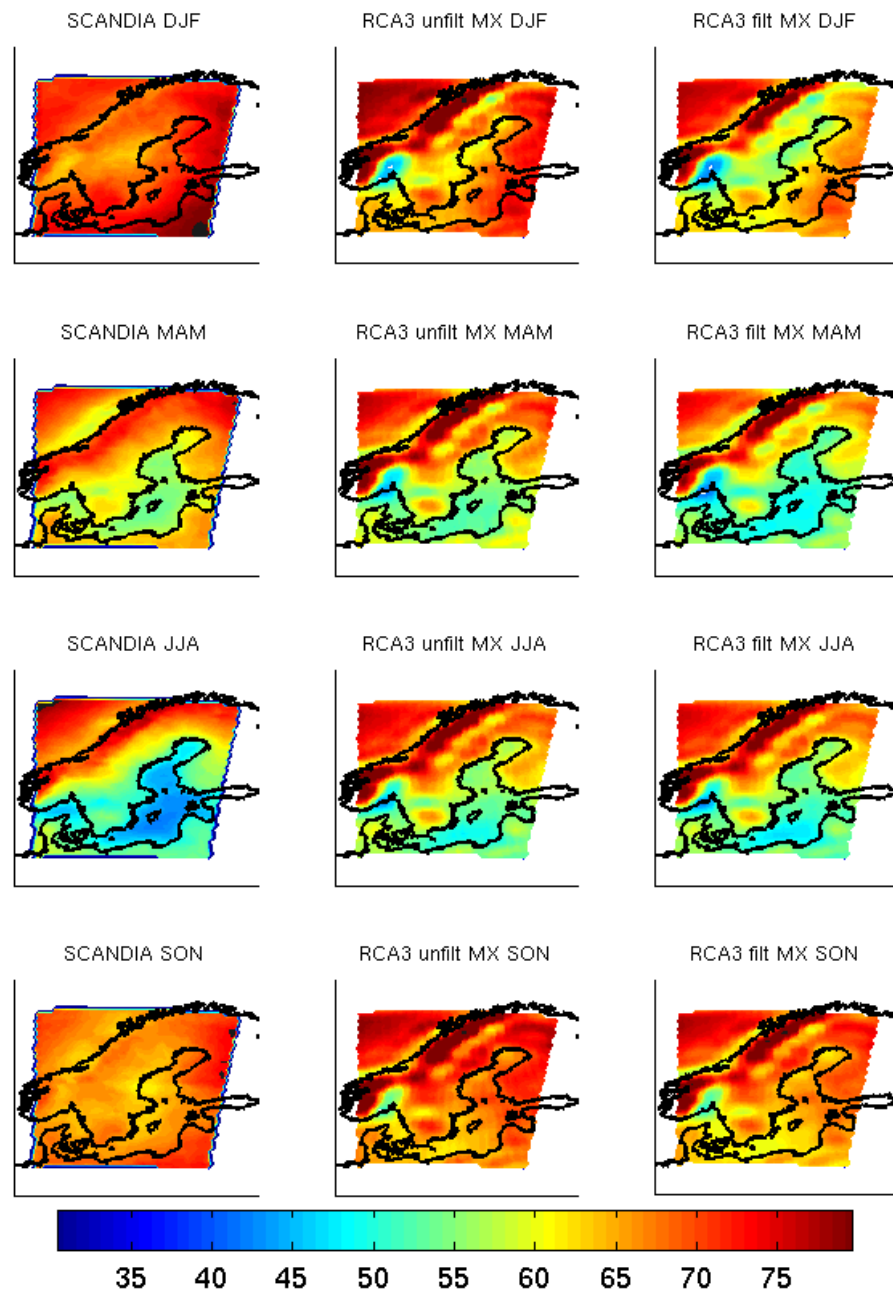


Figure 1. Seasonal means (winter, spring, summer and autumn from top to bottom) of total cloud cover (%) for SCANDIA (left column) in the period 1991-2000 compared with original (center column) and filtered (right column) RCA3 results using **Maximum** cloud overlap.

area mean of the cloud group contributions over the entire period. In addition, an over-representation of cloud categories with high optical thicknesses was seen for all vertical cloud groups for both the Maximum and the Maximum-Random cloud overlap. This feature was particularly strong for low-level clouds in the summer season.

Apart from this general appearance of cloud simulations deduced from area means, also some specific features of the geographical distribution of cloudiness were noticed. Most pronounced was an excess of cloud amounts over the Scandinavian mountain range for all seasons and for all applied cloud overlaps. Simultaneously, a deficit in cloud amount was found lee-ward (e.g., to the east) of the mountains along the whole extension of the Scandinavian mountain range.

The consequences for the RCA3 simulations of radiation conditions are expected to have the largest impact for surface radiation budget components (i.e., by reducing incoming solar radiation and increasing down-welling long wave radiation). Furthermore, the features seen at or in the vicinity of the Scandinavian mountain range are most likely associated with problems in correctly simulated the forced atmospheric flow over the Scandinavian mountain range and its effect on condensation and precipitation processes. Lastly, the deficit of mid-tropospheric clouds and the excess of low-level clouds could indicate particular problems in the vertical mixing of moisture between lower and middle tropospheric layers.

Has the Nordic climate turned windier ? What does ERA-40 say ?

Per Kållberg

The ECMWF 45-year reanalysis, ERA-40, is now available and many interesting climatological studies are underway.

The European Preview programme "proposes to develop, on a European level, new or enhanced systems for risk management". As a small part of Preview SMHI is mapping the windstorm frequencies - as analyzed in ERA-40 - in Europe during last 50 years. In the talk I will give a short presentation of ERA-40, mention something about Preview and show windstorm recurrence statistics from the Nordic region of Europe.

The NinJo Workstation

Mikkel Oldrup and Benny Koza
Danish Meteorological Institute

The NinJo project was started jointly by the German Weather Service, DWD, and the German Military Geophysical Service in the year 2000. The intention was to design and implement the next generation of the meteorological workstation used by forecasters. It should be able to replace most of the existing software systems. The reason for developing a new system was twofold:

- New demands from meteorologists could not be integrated in the existing systems without very large effort.
- The maintenance and further development of the existing systems had become very time consuming.

Other countries were facing the same problems. At DMI, the maintenance and porting effort of existing programs was at such a degree that the required in-house resources for development of new systems were not available. Therefore in 2002, MeteoSwiss and the Danish Meteorological Institute; DMI, joined the project. In 2004, the Meteorological Service of Canada, MSC, also joined the project such that the number of partners now is 5.

NinJo is developed as a pure Java system. The reason for choosing Java is that it is cross-platform available. The experiences of the partners clearly show that dependency on dedicated hard- and software environments requires a lot of porting effort when the availability of the environment, especially the operating system, is at an end. An effort which does not lead to any new functionality. With Java there is a choice of operating systems e.g. Windows and Linux. Java has also proved to be just as efficient as other languages, e.g. C++.

The main goals of NinJo are:

- It shall include all types of available meteorological information and allow them to be visualized on the same screen at the same time, allowing the meteorologist to compare different data types, among other things.
- It shall also be very flexible, allowing the user to define the exact setup, from which data to be displayed, to fontsize, colors etc.

In order to fulfil these goals, NinJo is to provide the following main features:

- Integrated 2D and 3D visualization of
 - point data including surface observations, soundings, lightning data, point forecasts etc
 - gridded data such as NWP
 - satellite and radar imagery
 - geographical data
 - and bulletins
- Batch chart production
- Data decoding and management
- Graphical editor
- Data modification - both point and gridded data
- Monitoring and alerting for observations and NWP data
- Support for multiple windows with data layering, multiple screens, and animation
- User customization and easy access to user defined favourites

The first NinJo version in operational use was 1.0 which was rolled out at the forecast offices of DWD and the German Military Geophysical Service in the summer of 2005. The current version of NinJo, 1.2, has just been put into operational use this summer. At DMI, version 1.0 was introduced in operational use at a number of seats in the central forecast office last autumn. Version 1.1 was rolled out early this summer.

The presentation at NMM will be split in two: Benny Koza will present an overview of the functionality of NinJo and the current status of the project. Mikkel Oldrup will give an introductory demonstration of the NinJo 1.2 workstation, and how it is used, seen from the eyes of a meteorologist.

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Har du aldrig förstått vad dom lärt ut om dynamisk meteorologi?

Då är det kanske du som är smart: Sju vanliga pedagogiska missförstånd

Anders Persson

Vanliga fel:

1. Geostrofisk anpassning (ser ut som en väluppföstrad bilist som kör ut på motorvägen, men egentligen råder "road rage")
2. Rossbyvågor (Rossby hade fel 1939, men rättade sig 1940 - men ingen förstod)
3. Corioliskraften (sunda förnuftet har sjärnat emot matematiken i 350 år)
4. Impulsmomentlagen (redan 1893 påpekades att den användes fel inom meteorologin)
5. Ferrelcellen (finns inte och beror på ett enkelt statistiskt missförstånd)

6. Varför vinden nästan lika ofta går mot högre som mot lägre tryck (eller "vad får vinden att sluta blåsa?")
7. Visst finns det orsak och verkan inom dynamisk meteorologi, men inte i den kvasi-geostrofiska

Seven sins in dynamical meteorological education: the mathematics is always correct, the computers are given the right equations, but the qualitative, intuitive explanations provided by many teachers do not only contradict Nature but also the mathematics they are supposed to illuminate:

1. Geostrophic adjustment in a stationary pressure field is often portrayed as a well-behaved motorist entering the high-way. In reality it looks more like "road rage". This "road rage" explanation helps us to understand why jet streams look like up-side down bananas and what "nocturnal jet streams" really are.

2. The last word of the famous British geoscientist Sir Harold Jeffereys was: -I have never understood what a Rossby wave is! No do most text book authors who frequently confuse the wave (which is defined from its stream lines) by a sine-shaped trajectory, which, on its own, has no chance in the world to make us understand why Rossby waves move to the west. Part of the blame falls on Rossby himself who provided a flawed explanation in his classical 1939 paper. The correction next year was overlooked. In 1940 people had other things to think about than Rossby's waves.

3. The Coriolis effect has been misunderstood by almost everybody since the 17th century when scientists started to think about the effect of the earth's rotation on moving objects. What is less known is that Newton was close to derive the Coriolis acceleration and this was done by Euler seventy years later. The Coriolis acceleration (on the NH) points to the left in contrast to the Coriolis force. This might sound confusing, but it actually makes it very easy to understand the whole Coriolis effect

4. In the 1870:s the great German scientist Helmholtz used the conservation of angular momentum to try to understand the global circulation. It was soon shown to be a misleading model, but still had a come-back in the 1920's before it again was proven wrong. The last one to re-introduce it was Rossby in 1941, but when he some years later started to have his suspicious his younger students asked him to shut up.

5. The American William Ferrel was a great contributor to our understanding of dynamic meteorology. It is a pity that the "Ferrel cell" does not exist in the physical atmosphere, only as a statistical misunderstanding, as some of Rossby's students made clear 50 years ago.

6. How come that the wind in the free atmosphere almost as often travels towards higher pressure (geopotential) as towards lower? Wind moving out from a low pressure area and into a high pressure area sounds counter to common sense, but that is because most of our common sense involves friction and studies of surface weather maps. Even more counter intuitive is the experience that violent and less predictable storms develop in association with these up-gradient winds.

7. The dynamical meteorological textbooks give the impression that the atmosphere, in contrast to the rest of the Universe, does not have any cause-effect mechanism. –Just like the hen and the egg, many say. But a hen can develop from an egg, but a hen cannot develop into an egg, so the parallel is not clear cut. Although the atmosphere, like any other object in the non-quantum world obeys causes and effects, ingenious minds have developed mathematical models which allows us to make diagnostic and prognostic calculations – if we pay the price of abandoning the cause and effect.

Är Östersjön en källa eller sänka av koldioxid?

Anna Rutgersson, Institutionen för Geovetenskaper, Uppsala Universitet

Det finns många tecken som tyder på att den uppmätta globala uppvärmningen beror av en ökad växthuseffekt och ökade mänskliga utsläpp av koldioxid och andra växthusgaser. Men de ökade halterna av koldioxid i atmosfären motsvarar bara ungefär hälften av de mänskliga utsläppen. En av de stora frågorna i förståelsen av klimat och klimatförändringar är att förstå kolets kretslopp. En mycket osäker del i kolets kretslopp är utbytet mellan atmosfär och oceaner, d.v.s hur mycket kol som går ned i haven. Hur stor effekten blir i ett innanhav på höga breddgrader som Östersjön är en intressant frågeställning.

Utbytet av koldioxid mellan atmosfär och hav styrs av skillnaden i koldioxidens partialtryck mellan hav och atmosfär, men också av den s.k. utbyteshastigheten. Man har tidigare trott att utbyteshastigheten bara beror av vindhastigheten över hav, men nya studier har visat att även andra faktorer har stor betydelse. Processer som skulle kunna vara viktiga är vågor, bubblor och stabilitet (dvs temperaturskillnaden mellan havsytan och luften). På mätstationen på den lilla ön Östergarnsholm, öster om Gotland, mäter vi en mängd olika parametrar för att studera hur atmosfären påverkas av havet. Vi mäter koldioxidhalten i luften och flödet av koldioxid mellan luften och vattnet. Dessutom har vi nyligen lagt i en boj ca en km sydost om mätstationen där vi mäter parametrar för att bestämma koldioxidens partialtryck vid vattenytan. Utöver mätningarna av koldioxidparametrar mäts på en mast, t.ex. vind på flera nivåer, turbulens, flöden av värme och vattenånga, det finns också ytterligare en boj i vattnet utanför där vi mäter vågor. Genom dessa mätningar kan vi förstå vilka processer som är viktiga för utbytet och ta fram uttryck för att beräkna utbytet. Dessa uttryck är mycket viktiga för de kan senare användas i modeller eller vid andra mätprojekt där man inte mäter det direkta flödet.

Med hjälp av modeller kan man sedan bestämma om Östersjön totalt är en källa eller sänka av koldioxid och vad eventuella framtida klimatförändringar har för effekt på detta utbyte.

Land-Surface processes in the Rossby Centre Regional Atmospheric Climate Model

Patrick Samuelsson and Stefan Gollvik, SMHI

The land-surface scheme (LSS) of RCA3 (Rossby Centre Regional Atmospheric Climate Model version 3) is a so called tiled scheme which means that individual sub surfaces or tiles within a grid square are characterised with unique values of surface properties like type of vegetation, roughness length and albedo. A separate energy balance is calculated for each tile. Different tiles respond differently to changes in fluxes depending on their heat capacity and heat transfer characteristics. Typical fast response tiles are forest and snow surfaces; forest has low heat capacity while snow has low heat-transfer capacity. Thus, the temperature of these surfaces is quickly reflected in the grid-averaged two meters temperature. Long term temperature changes depend more on phase changes and the heat capacity of the whole soil column. In this case the amount of snow storage and soil freezing processes are important.

From the atmospheric point of view the present LSS has three tiles with respect to temperature: forest, open land, and snow. The open land tile is divided into a vegetated and a bare soil part with respect to latent heat flux (surface resistance). The individual fluxes of heat and momentum from these tiles are weighted to grid-averaged values at the lowest atmospheric model level according to the fractional areas of the tiles. Local surface layer equilibrium is assumed over each tile which means that they have their own aerodynamic resistances. The forest tile is internally divided into three subtiles: forest canopy, forest floor soil, and snow on forest floor. The motivation for this division is that these subtiles are closely related to each other via the temperature and humidity conditions in the canopy air space. All together this gives 3–5 different surface energy balances depending on if snow is present or not.

The soil is divided into five layers with respect to temperature and consists of 2–4 subtiles depending on if snow is present or not. The discretization of the soil generally follows that of the ECMWF TESSEL scheme except for the two top-most soil layers which are 1.0 and 6.2 cm, respectively. At the bottom we use a no-flux boundary condition.

Totally there are eight prognostic storages of water in the LSS; interception of water on open land vegetation and on forest canopy, snow water equivalent of open land and forest snow, liquid water content in both snow storages, and two soil moisture storages. Interception of snow is not yet included in this version of the LSS.

The soil moisture is assumed to be independent on surface coverage which means that we need only two prognostic soil moisture storages, top and deep soil moisture. The top soil moisture layer has a depth corresponding to the depth of the two top-most soil layers for temperature while the depth of the deep layer is 1.0 m in mountainous areas and 2.2 m outside mountainous areas. There is no relaxation of soil moisture, thus runoff from the deep layer is used as input to a routing scheme.

Diagnostic variables of temperature and humidity at 2m and wind at 10m are calculated using Monin- Obukhov similarity theory. These diagnostic variables are calculated individually for each tile and are then area averaged for larger sub surfaces or for the whole grid square.

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MEDICAL GEOLOGY – Geological environment and global dust

Olle Selinus

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Because of the importance of geological factors on health an International Working Group on Medical Geology was established in 1998, with the primary aim of increasing awareness of this issue among scientists, medical specialists, and the general public. In 2000 a new project was established by UNESCO. The primary aim of the projects were to bring together, at the global scale, scientists working in this field in developing countries with their colleagues in other parts of the world. The International Council of Scientific Unions (ICSU) also sponsored international short courses in this subject, a cooperation involving The Geological

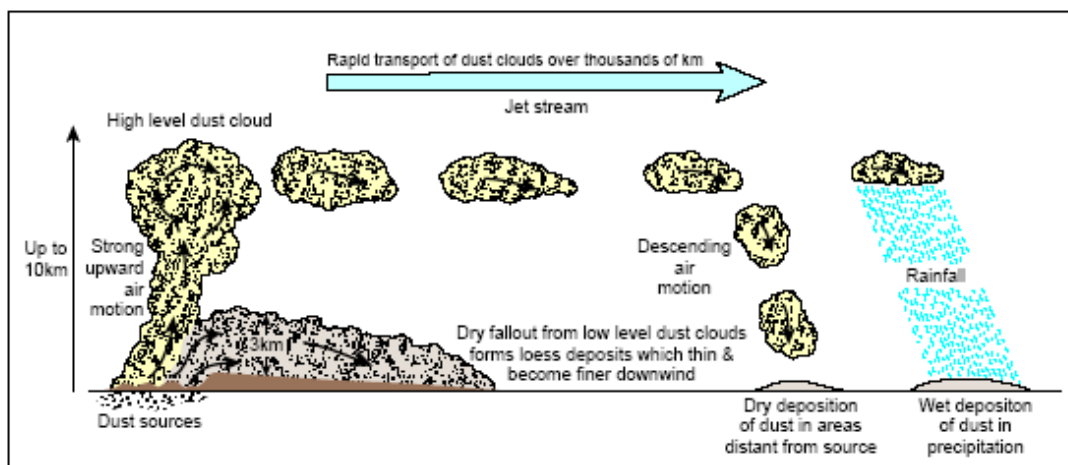
Survey of Sweden, US Geological Survey and the US Armed Forces of Pathology. In 2006 a new association was established: International Medical Geology Association, IMGA.

Regional Divisions all over the world have been established. Two text books have been published, the most recent one by Elsevier 2005: Essentials of Medical Geology which has received two prestigious international awards and which contains some chapters on the global transport of dust. A website (<http://www.medicalgeology.org>) and regular newsletters have been published. Short courses on medical geology, have been held since 2001 in e.g. Zambia, Chile, Brazil, Russia, Canada, Puerto Rico, UK, Lithuania, China, Australia, Malaysia, Venezuela, Mexico, USA, Peru, China, Japan, India, Ukraine, South Africa, Mozambique, Puerto Rico, Romania, Brazil, Argentina, Uruguay and several other countries.

Medical geology will also be one of the ten main topics within the Year of Planet Earth declared by UN General Assembly December 22, 2005. The year will be a triennium between 2007 and 2009. One of the priority areas will be global dust. Medical geology is also one of the five topics within the GeoUnion initiative. The international impact has been tremendous. Universities all around the world are starting courses and education in medical geology, the first centers are under construction, symposias have been held and a world wide collaboration has started between geoscientists, environmental researchers, epidemiologists, toxicologists, pathologists and other scientists.

Medical Geology and Atmospheric Dust: sources, transport, and health impacts

We live in a dusty world; the dust that falls in our backyard (the 'sink') may have originated thousands of miles away (the 'source').



Principal atmospheric pathways between dust sources and dust sinks, involving both dry and wet deposition modes.

Dust is a global phenomenon. Dust storms from Africa regularly reach the European Alps, and Asian dust outbreaks can reach California in less than a week, some ultimately crossing the Atlantic and reaching Europe. Dusts from the Gobi desert reach Europe and volcanic eruptions affect the whole globe.

The ways in which dust impacts upon life and health are wide-ranging. These include –
changes in the planet's radiative balance
transport of disease bacteria to densely populated regions
dumping of wind-blown sediment on pristine coral reefs
general reduction of air quality
provision of essential nutrients to tropical rainforests.
toxic substances

Mobilization of dust is both a natural and a humanly triggered process. We mobilize dust when we disturb the land surface or strip it of its vegetation. Changing climatic conditions play a key role as natural changes occur in available moisture and wind speeds. Although vegetation exerts a critical control on dust mobility, vegetation itself is influenced by climate, human activity and other factors.

How extensive is the health impact of global dusts?

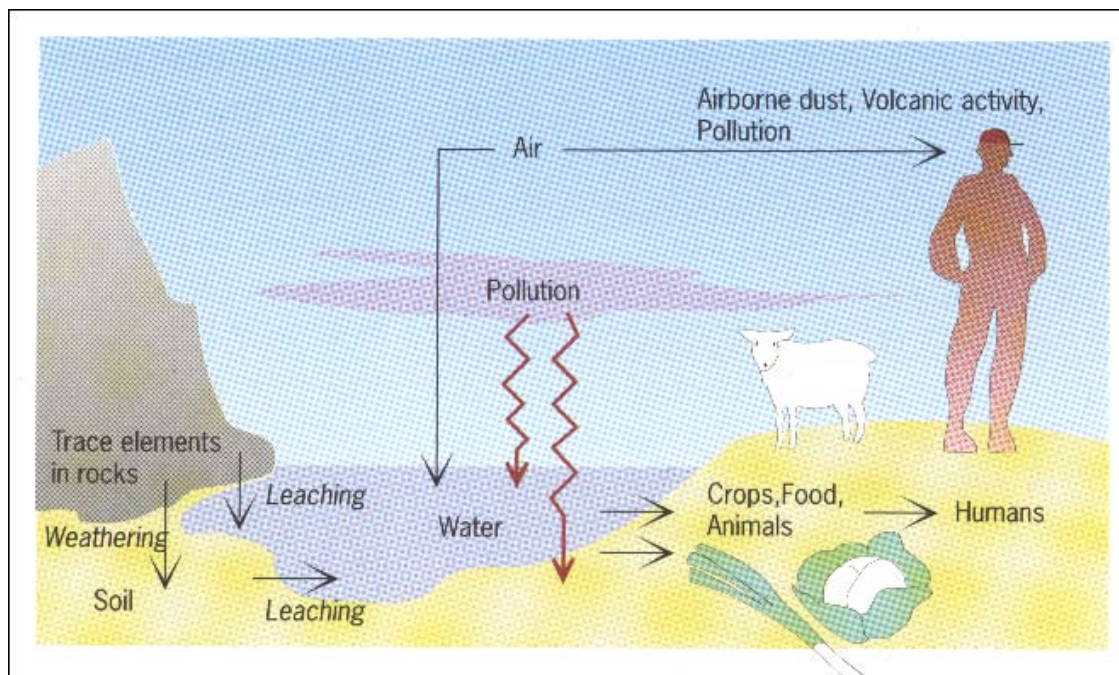
The precise nature nor the epidemiology of the impact on human health of natural atmospheric dusts (non-occupational lung disease) is not known in any detail. Very fine particles may penetrate deeply into the lungs to cause silicosis, asbestosis and other lung conditions. The denser the dust concentration, the higher the rates of chronic respiratory disease and associated death rates.

Natural (non-occupational) silicosis was first reported in some Bedouin people in the Sahara Desert in the middle of the 20th century, and has since been found in Pakistani farmers, Californian farm workers, Ladakh villagers, and Thar Desert residents (NW India), as well as in northern China. While little quantitative information on natural silicosis is available, studies showing an incidence of over 22 % of the population of some Ladakh villages and over 21 % in people over 40 years of age in settlements in North China make it likely that the population affected in Asia is probably numbered in millions.

Both land surface and atmospheric dusts will have to be more closely studied. On land, dust source and deposition regions must be identified, and the ways in which movement of dust (dust fluxes) have varied in the recent past and under various climatic conditions must be determined. There is still much to learn about dust transport mechanisms and pathways, as well as the influence of atmospheric dust on the Earth's radiation balance. Such work requires expertise in land surface processes, geochemical/isotopic 'fingerprinting', analysis of past climates, remote sensing, and close investigation of atmospheric radiation and dynamics. Incorporating dust into climate models (from source to sink) will improve understanding and enable us to provide predictions on several time scales (weeks to centuries).

Earth and Health, or Medical Geology, is thus concerned with the relationship between natural geological factors and human and animal health, as well as with improving our understanding of the influence of environmental factors on the geographical distribution of health problems. Medical Geology brings together geoscientists and medical/public health researchers and also meteorologists to address health problems caused, or exacerbated by geologic materials and geologic processes including volcanic eruptions, earthquakes and atmospheric dust.

The presentation will include examples of global effects of dusts and volcanic eruptions and also more local examples such as Valley Fever in USA.



Direct links between geology and health are provided by the food chain and by inhalation of atmospheric dusts and gases. (After Möller, L. (ed.) 2000. Environmental Medicine. Joint Industrial Safety Council, Sweden. Drawn by Vera Mulder)

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Research and Education in Arctic Meteorology at the University Centre in Svalbard, UNIS

Anna Sjöblom
 The University Centre in Svalbard (UNIS)
 Norway

The University Centre in Svalbard (UNIS), located in Longyearbyen (79°N), is a state-owned limited company. The universities of Oslo, Bergen, Tromsø and NTNU in Trondheim are represented on the board. The objectives of UNIS are to provide university level education in Arctic studies, to carry out high quality research, and to contribute to the development of Svalbard as an international research platform. The archipelago's geographical location in the High Arctic makes it an ideal venue for laboratory work and also for the acquisition and analysis of specialist data.

UNIS has four departments: Arctic Geophysics, Arctic Biology, Arctic Geology and Arctic Technology. The courses in these four lines of study are intended to complement the teaching given by the mainland universities, and they are integrated in standard courses of study that lead to examinations and degrees at intermediate, advanced and doctoral level. All courses are given in English and half of the students are from abroad.

All UNIS research and courses are based on the exceptional location of Svalbard and the pre-eminence of this region as an "Arctic laboratory".

Meteorology is part of the Arctic Geophysics department, at which we cover physical processes from the bottom of the ocean all the way up to the upper atmosphere, including oceanography, snow and ice physics, auroral physics etc. The main focus for meteorological research is experimental boundary layer meteorology and air-ice-sea interaction in close cooperation with especially oceanography and snow and ice physics. The unique location of UNIS also makes multi-disciplinary research possible and it is not uncommon that meteorology cooperates with biologists and geologists.

UNIS offers courses in Arctic meteorology and related areas, which are intended to be compliments to the ordinary courses, focusing on features that are specific for Arctic regions. For example: "Polar Meteorology and Climate (15 ECTS)", "Polar Atmosphere Chemistry – Trace Gases and Aerosols in the Arctic (10 ECTS)", "Air-Ice-Sea Interaction (15 ECTS)", "Snow and Ice Processes (15 ECTS)" and "The Middle Polar Atmosphere (15 ECTS)".

More information can be found on <http://www.unis.no>

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Det marina atmosfäriska gränsskiktet

Ann-Sofi Smedman, inst. för geovetenskaper, Uppsala univ.

I numeriska klimatmodeller och väderprognosmodeller måste man ha detaljerad kvantitativ information om växelverkan hav/atmosfär:

(i) Utbytet av impuls mellan atmosfären och havet, det vill säga hur vinden påverkas av vågor och själv bygger upp vågor. Detta har betydelse för beräkning av hur vindsystemen 'bromsas', hur havsvågor byggs upp och dör ut och för hur havsströmmar genereras.

(ii) Avdunstningen, som är av fundamental betydelse för molnbildning och nederbörd, inte bara över haven utan över hela jorden, eftersom en stor del av nederbörden över land härrör från vatten som avdunstat över hav.

(iii) Utbytet av kännbart värme vid havsytan. Detta flöde är energimässigt oftast mindre än motsvarande flöde från avdunstningen. Tillsammans ger emellertid de båda flödena (ii) och (iii) ett energitillskott till atmosfären som utgör en stor andel av atmosfärens totala nettoenergitillskott. Den geografiska fördelningen av dessa flöden driver i hög grad den globala atmosfäriska cirkulationen.

De formuleringar som idag finns i de numeriska atmosfärsmodellerna för beräkning av flödena (i) - (iii) bygger på omfattande mätningar över olika delar av världshavet och ger tillfredsställande resultat för många situationer. Forskning under de senaste åren - inte minst vår egen - har emellertid identifierat ett antal situationer där dessa modeller ger felaktigt resultat.

Ett viktigt verktyg för vår forskning utgör den fältstation för marin forskning som vi har byggt upp på den lilla ön Östergarnsholm öster om Gotland. Sedan maj 1995 utför vi där i en 30 m hög mast mätningar av bland annat de turbulenta flödena (i) - (iii). Våghöjd och vågriktning mäts med en så kallad 'waverider buoy' utanför ön. För att få information för ett djupare luftskikt har kompletterade mätningar utförts med ballongburen mätut-rustning, flygburna mätningar och fjärranalysmätningar.

Vi har gjort grundläggande framsteg vad gäller förståelsen av hur vågor påverkar de processer som styr det turbulenta utbytet av impuls, (i) vid havsytan. I storskaliga klimat- och väderprognosmodeller används idag en förenklad beskrivning av dessa processer, som är liktydig med att väsentliga paralleller dras till motsvarande processer över land. Vi har kunnat visa att denna analogi endast är giltig under den fas då vågor håller på att byggas upp. Då dominerar korta vågor, som rör sig långsamt över havsytan, och atmosfären "ser" vågorna på samma sätt som fasta hinder på en landyta. Sådana förhållanden råder under en mindre del av all tid. Under huvuddelen av tiden finns relativt långa vågor, som rör sig fortare än vinden, alltid närvarande. Dessa förändrar atmosfärens turbulenta transportprocesser på ett komplicerat sätt och vid tillräckligt kraftig dyning kollapsar turbulensen och inget utbyte sker.

Under de senaste åren har vi koncentrerat vår forskning kring utbytet av värme och vattenånga. Det är allmänt känt att modeller oftast överskattar värme- och vattenångeflöderna. Vi har visat att vågfältet vid vindar under ca 10 m/s ger upphov till lägre utbyte än vad de nu använda beräkningsrutinerna ger. Vid högre vind är förhållandet det omvända, det vill säga dagens modeller underskattar avdunstning och överföring av värme från havet till atmosfären. Genom att jämföra mätningar över land och hav har vi identifierat en mycket speciell överföringsmekanism som för höga vindhastigheter och liten temperaturskillnad mellan luft och hav ger mycket stora flöden.

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"AIR-OC, VIRILITY AND THE BIRTH OF POLAR LOWS."

Egil Stokke, University of Bergen, Norway.

The main object is to give an **unmathematical** and **visual** access to some new ideas and concepts on the **diabatic** air-sea interaction: How to simply **see** what is seemingly chaotic, to afford a rational **measure** of a seeming **mess**, thus **resolving** turbulence by **non local/non empirical** relations, and showing its vital role even on synoptic scales.

The key **concept** is the **PIP**: A **Process of Intermittent Permeability**. This quantifies a **mixed scale** problem by a dynamical **implicit** parameter, ν , linking updrafts to larger scales. The updraft **level** and the **gradient** of the SST, sea surface temperature, are central new elements. Applied in the dynamical equations, **PIP** and classical principles makes **explicit** that: $\nu = 1/3$. Then a lot of new and detailed information consistently nests up.

Examples are:

Surface fluxes; **Structure** and capping positions of **convective** boundary layers; **Creation** of cold outbreaks; **Birth**, growth, propagation, and even **form** (warm, circular!) of **PL**'s and exploding **off-coastal/off** ice developments. **Upstream** conditional unstable conditions are favourable. The **energy** cycle is clearly exposed, and the utmost simple "linear/modal" theory quantifies large **ageostrophies** and accounts for **non** symmetrical cloud and velocity fields. A **marine blocking** mechanism may as well be inherent - and the exploding **hurricanes**?

The theory exposes a very simple, still consistent **picture**, helping to **understand** some meteorological phenomena. To show that it may also be **adequate** and **realistic**, some **PL** cases are roughly displayed. These in fact suggest how **satellite** information of the more **persistent** SST may be **very** useful to the **practicing** forecaster troubling with the **shorter** time scales!

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TWP-ICE och tropisk konvektion.

Andreas Vallgren

This M. Sc. thesis studies the statistical characteristics of convective storms in a monsoon regime in Darwin, northern Australia. It has been conducted with the use of radar. Enhanced knowledge of tropical convection is essential in studies of the global climate, and this study aims to bring light on some special characteristics of storms in a tropical environment. The observed behaviour of convective storms can be implemented in the parameterisation of these in cloud-resolving regional and global models. The wet season was subdivided into three regimes; build-up and breaks, the monsoon and the dry monsoon. Using a cell tracking system called TITAN, these regimes were shown to support different storm characteristics in terms of their temporal, spatial and height distributions. The build-up and break storms were seen to be more vigorous and particularly modulated diurnally by sea breezes. The monsoon was dominated by frequent but less intense and vertically less extensive convective cores. The explanation for this could be found in the atmospheric environment, with monsoonal convection having oceanic origins together with a mean upward motion of air through the depth of the troposphere. The dry monsoon was characterised by suppressed convection due to the presence of dry mid-level air. The effects of wind shear on convective line orientations were examined. The results show a diurnal evolution from low-level shear parallel orientations of convective lines to low-level shear perpendicular during build-up and breaks. The monsoon was dominated by complex orientations of convective lines.

The thesis includes a study of merged and splitted cells, which have been separated from other storms, and mergers were shown to support more vigorous convection in terms of height distribution and reflectivity profiles. They were also seen to be the most long-lived category of storms as well as the most common type. Split storms were generally weaker, indicative of their general tendency to decay shortly after the split occurred.

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PREVIEW – A WAY TO MANAGE RISKS FROM WEATHER

Kerstin Vejdemo

PREVIEW is a European Commission FP6 Integrated Project.

It aims at developing, on a European level, new geo-information services for natural and industrial risk management in order to minimize the damages.

The risk management will be a new set of services built from

- **PREVENTING the risk**
- **MONITORING the situation**
- **ASSESSING the impacts**
- **CAPITALIZING on the experience**

The hazards chosen are problems in many countries in the European Community.

Together we know a lot about them and deal in different ways to solve the problems.

- Preview will gather and compare the requirements from the end-users with the knowledge from the experts and Civil Protections. Then we decide if we need more development to make useful service portfolios to better risk management.

The result will be presented in a form, useful to communities, operators and industry. But in different countries the needs are different, as the presentation possibilities.

Natural RISKS, are divided into geophysical and atmospheric risks. The major atmospheric risks are windstorms, flooding and forest fires. Geophysical risks are landslides, earthquakes and volcanoes. The third area is called Man made risks, where pollutant dispersion from industries and transport are in focus.

A European team of 58 partners from 15 countries has been set up to develop the services within 45 months. It will be complete in December 2008.

TEST SITES are set up in 8 countries for different services. In Sweden Räddningsverket, SRSA, work with the municipalities of Sundsvall, Kristianstad and Västerås as test sites for man made risks and flooding. In Kristianstad flooding is the overwhelming risk, while the other see transport and industry pollution as greater problems. Volcanoes, landslides, fires and earthquakes are more Mediterranean problems.

You will hear more about it!



Activities in the Nordic cooperation on quality control of meteorological observations

Flemming Vejen

The NORDKLIM cooperation (*NORDisk KLIMasamarbeid*) consists of several projects, but the presentation concentrates on only one of these: development of methods for quality control of meteorological observations (NORDKLIM-OBS).

The purpose of NORDKLIM-OBS is to secure high quality and consistency of observations in order to maintain, administrate and exchange good time series of climate data. At present, the NORDKLIM-OBS group is dealing with three activities:

1. Quality control of raingauge observations by using weather radar data
2. Improvement of routines and software for homogeneity control
3. Identification of missing and needed modules in manual quality checking

In the first activity, the purpose is to discuss and describe methods for qualitative use of radar data in quality control. A report is being prepared focusing on checking methods, sources of error and radar products at each NMS. Examples show the potentials for quality control, and it is a plan to conduct various quality control experiments and to prepare recommendations for best practices.

Homogeneity control is required for identification of breaks in time series, for example caused by movement of stations or equipment, changes in station environment or implementation of new equipment. Identification of true breaks requires careful examination of data and may include complex procedures. The goal of the activity is to improve the possibilities for carrying out effective testing of time series. A FTP site has been established from where a sophisticated software package can be downloaded. Extensive testing of the package against known breaks will be prepared in order to compare its effectiveness against software in operation. The work focuses on reasons of breaks, how to secure time series and on recommendation for best practice.

At the NMS's, special attention was been paid to automatic quality control. However, experience shows there are always a small number of observations left that must be subject to manual inspection. To make such control as easy as possible, software is required for effective comparison against independent data, e.g. satellite and radar images, climate information, metadata, errors flags, synoptic observations, interpolation maps, statistics and time series plots. Each NMS has own software systems, but more or less these are under development and may not satisfy all requirements and wishes. Therefore, the goal of the activity is to identify missing and needed modules for manual control, to discuss techniques and practises, and to exchange knowledge.

In the NORDKLIM-OBS working group it is discussed which new activities to start over the next three years. The working group has put high priority to methods and algorithms for spatial quality control of observations. At a later stage, other activities may be started aiming at density of station networks, further development of NORDKLIM data set, better presentation of data e.g. in publications and on web sites, and establishment of a portal for exchange of climate data and information.

GlobalWarming with a Global Perspective – Integrating Climate Change Topics into Meteorology and Statistics Curricula

(Videopresentation)

E. Walters and I. Arkan Marymount School of New York, New York, NY, USA

This paper will provide a review of the development and implementation of “It’s All About Connections” an interdisciplinary project completed by students in AP Statistics and Meteorology at the Marymount School of New York as well as students in the global network of schools. Students analyze the climatological record for evidence of global warming in both various cities in the United States and Canada Students seek to answer the following questions using appropriate statistical techniques: Has the average annual temperature increased over time? Or has it remained relatively constant?

What information about potential global warming does this record truly hold? Students in both courses learn the basics of climatological analysis as well as more advanced statistical applications in analyzing the data. Furthermore, a discussion of locating and verifying appropriate data sources, planning guidelines, assessment techniques and the use of student-produced multimedia statistics tutorials will be also presented.

Then, working cooperatively with various schools in Europe and Asia, students further investigate the causes of global warming, the potential effects of failing to reduce global warming, traditional and creative solutions to reduce the impact of global warming. Students then propose and debate effective local and regional solutions to reducing the potential impact of global warming. The use of global communications media such a videoconferencing, web logs and online journals and e-mail exchanges will be reviewed. Additional opportunities for collaborative projects in meteorology for the global classroom will also be discussed.

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En översikt över jordens klimathistoria – från uratmosfär till skenande växthuseffekt

Anders Wettergren

Tanken i denna exposé är att bit för bit ”avtäckas” jordens klimathistoria och det görs genom att man hela tiden vidgar perspektiven tillbaka i tiden. Exposén kommer att belysa den stora klimatvariation som jorden genomgått, ända tillbaka till den tid då atmosfären såsom vi känner den skapades för nästan 2 000 miljoner år sedan. Det är också en resa genom källorna, från dagens observationer, via historiska källor, pollen, trädringar, grönländska isbörnkärnor, havens sedimentbörnkärnor till fossila och geologiska indikatorer. Och allt vittnar om samma sak. Det är svårt att hitta något som kan kallas för ett naturligt atmosfärstillstånd. Klimatet är dömt till evig variation, oberoende av vem eller vad som påverkar den.

Det här är förstas en mycket komplex historia och det är inte mycket som man med säkerhet kan säga om sambanden. Detta är därför huvudsakligen en beskrivning av samtida händelser, det globala klimatets variation sedd parallellt med livets utveckling och de ständigt varierande geografiska och geologiska förutsättningarna. Man kan ändå inte undgå att se intressanta samband mellan dessa variabler, samtida händelser som måste vara allt annat än tillfälligheter. Därför kommer också ett antal tolkningar att redovisas allteftersom vi borrar oss tillbaka ner i historien.

Översikten avslutas med att vi kommer tillbaka till nutiden för att kort se lite framåt.