Working Area Physics

Progress report

Prepared by:	Area Leader Neva Pristov
Period:	January - December 2015
Date:	25 February 2016

1 Progress summary

This report gives an overview of the progress of research and development in the year 2015.

The first version of ALARO-1 physics package (available in the end of 2014) is in an operational use in CHMI since January, while in other services its validation is on-going. The main developing topic is determination of shallow convection cloudiness, as this is an important input to the radiation scheme and is also missing ingredient to complete turbulent scheme TOUCANS. After extensive developments in past years, for both ACRANEB2 and TOUCANS schemes, significant effort was invested into preparation of the documentation. Parameterization of orographic effects on surface radiation in AROME-SURFEX (made in collaboration with Météo-France and HIRLAM), improves the results and is tested in the pre-operational AROME at ZAMG and Météo-France.

There were some changes for the research/development stays, few were cancelled and two new were added. Ivan Bašták Ďurán, who was working on turbulence parameterization for last 9 years, left the CHMI in summer. He was the key person for TOUCANS therefore additional effort would be needed to continue with TOUCANS validation. Doina Banciu from Romania, who help a lot with validation of new drafts computation in recent years, retired in the beginning of 2015.

2 Scientific and technical main activities and achievements, major events

Action/Subject: **Turbulence scheme TOUCANS**

Description and objectives:

Turbulence scheme TOUCANS is integrated into first version of ALARO-1. The proposed operational set-up includes a new type of stability functions (so-called model II), moist third order moments, turbulent diffusion of cloud condensates and the use of total turbulent energy TTE, but still the same type of length scale computation and the shallow convection as in ALARO-0. Further validation is needed to profit from other available important novelties. The important task is verification of wind forecast quality and the improvement wind gust diagnostics.

Research and developments should continue on prognostic mixing length and computation of shallow convection cloudiness. A target is to obtain a complete scheme with many modern options for computation of turbulent fluxes of momentum, heat, water vapour and cloud condensed water.

Contributors: I. Bašták Ďurán(Cz), R. Brožková (Cz)

Efforts: 10 person months

Documentation, deliverable: code modification, coded algorithm for Shallow Convection, TOUCANS technical documentation, presentation, stay report

Status:

A very detailed description of TOUCANS with all relevant information was written by Ivan Bašták Ďurán. Inside, all main parts of TOUCANS that are currently used in physical package ALARO-1 are summarized, additionally also all developments of TOUCANS that are not fully completed. There is also part devoted to code implementation and guidance for the user with description of namelist parameters This document is a very good base for one who is going to continue on this subject. While preparing this document some weak points in the code were spotted, so further scientific validation and code check is needed.

One of uncompleted ingredient is a better diagnostics of Shallow Convection Cloudiness (SCC) which is needed to obtain the complete scheme. SCC is crucial for computation of moist buoyancy flux (non-linear relationship dependent additionally on skewness parameter - (Marquet and Geleyn, 2013)), but also for turbulent diffusion of cloud condensates and TOMs computation.

Proposed description of shallow convection uses a mass-flux type of computation and is based on the recent work (Geleyn and Marquet, 2013 and Lewellen & Lewellen, 2004). One of main ingredients is the computation of a ratio between dry and saturated atmospheric conditions, on which bases shallow convection cloud vertical profile can be obtained. Method is similar to the one for moist deep convection in 3MT, but with a lot of simplification as shallow convection is not producing precipitation. Mixing is dependent on the turbulent activity via turbulent kinetic energy. The algorithm to compute mass-flux type shallow convection profile was coded and tested, also the values of entrainment coefficients were tuned. The procedure was combined with the moist turbulence computations and further tested. Simulations give quite realistic cloudiness and mixing in the PBL, just in summer situations there are too much SCC produced, mixing in PBL is not high enough. Investigation how to cure this problem is ongoing.

Action/Subject: **Radiation scheme**

Description and objectives:

Radiation scheme ACRANEB2 is integrated into ALARO-1 version. Improvements in the cloud-radiation interaction are planed by taking into account better information

on cloud cover (especially shallow convection cloudiness from turbulence scheme) and by getting microphysical cloud condensates into radiation scheme. Some additional tests are foreseen while preparing a scientific paper on the long wave radiation part of ACRANEB2.

The ACRANEB2 scheme is part of the HARMONIE radiation comparison. Adaptations to improve also climate simulations will be studied.

Contributor: J. Mašek (Cz)

Efforts: 7.5 months

Documentation, deliverable: code modification, scientific paper on short wave radiation part is published in QJRMS, scientific paper on long wave radiation part is in preparation

Status:

Some additional work (verification against CIRC benchmark cases, evaluating impact of a spectral albedo and possibility to compute unscaled direct solar flux) was needed to complete the paper on description of short wave radiation part in ACRANEB2. Description of long wave radiation part is in preparation. To demonstrate capabilities of NER approach a long wave narrowband reference (with inclusion of clouds) was prepared. Verification against line by line reference (LBLRTM) results on CIRC benchmark cases showed that two minor issues revealed in LW part: accuracy of broadband Voigt effect treatment (which is only important above 50 km altitude) and assumption of isothermal source term (can be source of error in layers with large temperature gradient).

As ACRANEB2 has been operational for almost a year at CHMI a systematic verification over longer period was made. Daily means of forecasted SW global and LW downward radiation at surface were compared against ground measurement. Strong yearly variation of SW bias is noticed, bias is larger in cold season and is related to underestimated cloud cover used inside radiation scheme (Figure 1). This problem is illustrated also with a case study for 14 October 2015 (large area covered with low clouds) when SW global radiation was overestimated for more than twice in some observation points. Cloud treatment inside radiation scheme is very important, computation of cloud overlaps was revisited. As a first cure an exponential-random cloud overlap (like it is used in microphysics) was introduced into radiation scheme where random or maximum random overlap between cloud layers are currently possible. With improving the treatment of cloud overlaps values are lower (Figure 2), but not enough because also low clouds were underestimated. In order to improve model performance in winter weather situations with temperature inversions the cloud inputs passed to radiation are crucial. The methods of cloud overlaps are going to be further validated.

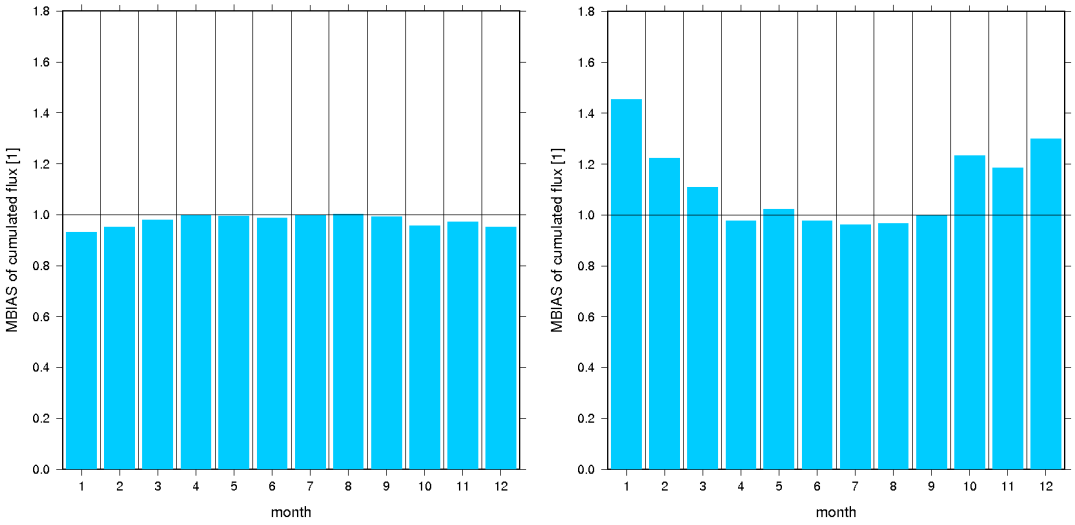

Figure 1: MBIAS of daily downward surface LW flux (left) (1 station) and SW flux (right) (19 stations) for year 2015.

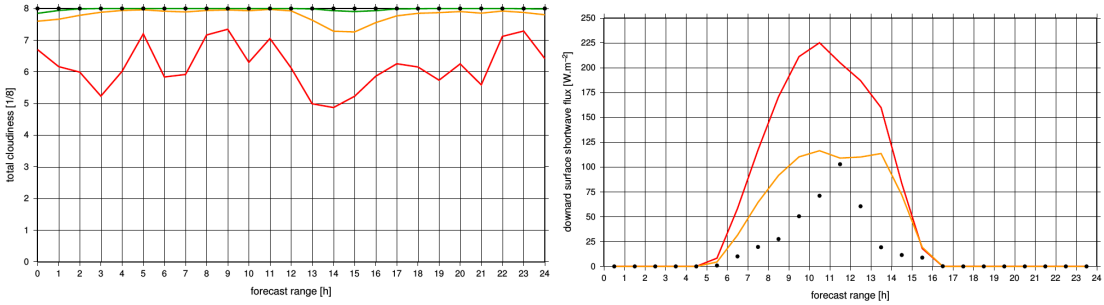

Figure 2: Total cloud cover against the lead time (left) at station Pardubice; downward surface shortwave flux (right) at station Hradec-Kralove; black points- measurement, red - maximum-random overlap method for radiative cloud cover, yellow - exponential maximum-random overlap method for radiative cloud cover, green - nearly maximum-random overlap method for diagnostic cloud cover.

By product of developments are also additional fields in post-processing (true direct solar flux at surface, sunshine duration), useful for verification against measurements, while current (delta-scaled) direct flux is still recommended for users from energetic sector.

Support was given for the comparison of 3 available radiation schemes (IFS, HLRADIA, ACRANEB2) inside HARMONIE system by the HIRLAM radiation group. Short description of ACRANEB2 is included in their paper on radiative effect of aerosols.

Peter Kuma, who tested various intermittency strategies in 2014 (this is also part of his diploma work), finished his University study. He has not accepted our invitation for further collaboration as he has now other goals.

The solar eclipse on the 20 March 2015 was very nice opportunity to test ACRANEB2 scheme (Figure 3). Due to clear sky conditions in Central Europe the eclipse impact was apparent. Daily sum of surface global radiation was reduced by app. 10% and 2m temperature drop for more than 1 deg. C.

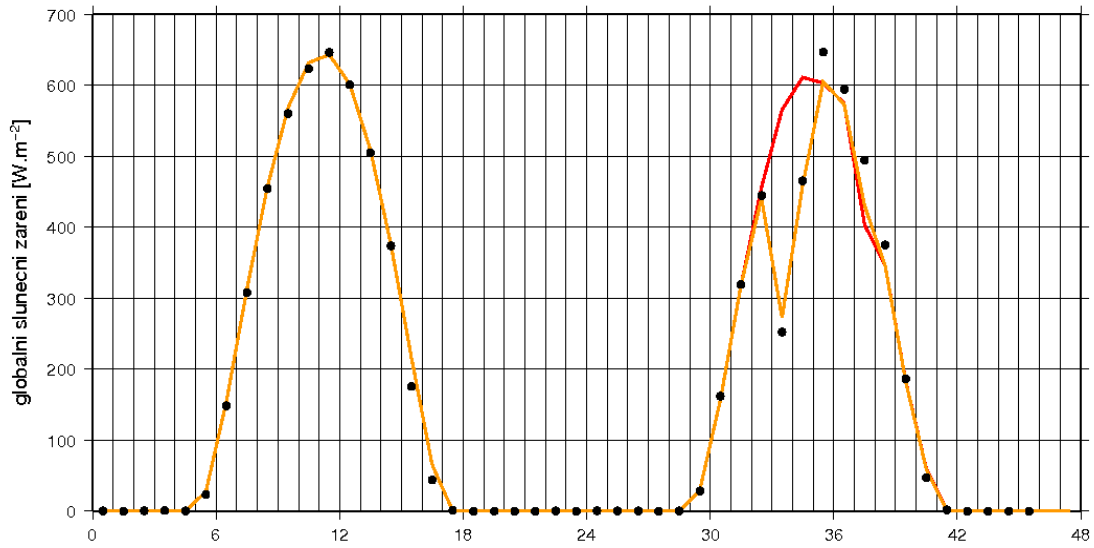

Figure 3: Simulated and observed surface global radiation, red curve is control run without eclipse, yellow curve is run with eclipse, black points are observed values at station Prague (19 and 20 March 2015). Due to clear sky in the first day forecast is almost perfect, second day eclipse is seen in second day, some difference are due some clouds in the model simulation.

Action/Subject: Cloud scheme

Description and objectives:

The objective is an unification of the cloud-cover concept within ALARO-1. After careful analysis, it was decided not to aim at a single computation of cloudiness, like for instance in Tompkins (2002), but go for an alternative approach, to build bilateral correspondences and/or combinations for all cases where two parameterisations interact at the level of the cloud-cover definition. For example, in precipitation process combination of stratiform and deep convective cloudiness is used.

Relatively small upgrades with respect to current ALARO-1 version are needed. This transversal change is touching many feed-back loops, hence its practical consequences is quite unpredictable.

Contributors: R. Brožková (Cz), I. Bašták Ďurán(Cz), J. Mašek (Cz)

Efforts: 1.5 months

Documentation, deliverable:

Status:

Determination of the cloud cover and condensates is very important input for the radiation. This can be improved by taking into account shallow convection cloud cover diagnosed in the turbulence scheme. The ALARO-1vA configuration still deploys the shallow convection scheme based on the modified Richardson number (Geleyn,J.-F. , 1987). Resulting shallow convection cloudiness is too scattered and may occur also above the PBL top, and as such is not suitable to enter the radiation scheme. New approach to simulate shallow convection based on vertical mass-flux profile is under development (see under TOUCANS scheme). First studies show that scheme produces quite high amount of shallow clouds and when they are included into cloudiness entering radiation computation, deep convective activity is reduced as a feed-back. So some retuning of the current amount of cloudiness used in radiation seems necessary.

Action/Subject: 1D2D turbulence scheme

Description and objectives:

The aim is to simulate the 3D effects of turbulence in the model. This can be achieved with the extension of vertical turbulence scheme TOUCANS by consistent components for horizontal part obtained from SL interpolation stencil.

A first version of this 2D extension of the present 1D turbulence scheme is available in the model. However the experience from running any such 3D-like schemes of turbulence in typical NWP resolutions between 100 m and 3 km (where the horizontal eddies should already play a role) and highly anisotropic grid with vertical resolution being fairly finer compared to the horizontal one is rather minimal. So first task is validation of the existing code and inter-comparison with some LES and/or academic simulations to get experience how the TOUCANS and 3D extension behaves. Later real case high resolution simulations with full 3D environment (convection, radiation and good surface parameterization) can follow. The aim would be to study the effects of transition from turbulence to (deep) convection and its role to the realistic shallow and deep convections simulation.

Proposed contributor, Estimated efforts: *I. Bašták Ďurán (Cz), 0.5 months*

Status: Pending. This task has low priority.
The 1D2D turbulence scheme was successfully tested in the cycle CY38t1_op3 which contains ALARO physical package version ALARO1. Both, the horizontal and the vertical,

components are available and the code is up to date. The 2D academic and 3D real experiments were performed. See Report from working area Dynamics and Coupling.

Action/Subject: **Operational applications: from ALARO-0 to ALARO-1, SURFEX**

Description and objectives:

The ALARO-0 baseline version is used in operational or pre-operational applications in all LACE countries. Its evaluation by the users shows strength and weaknesses of the model simulations. Some weaknesses (diurnal cycle of precipitation, light precipitation pattern) are improved in the first version of ALARO-1. Local teams will validate and test ALARO-1 version for the (pre-)operational use and also perform experiments at resolutions around 2 km. Support will be available.

For the model description of the surface/canopy layer and below, the externalized SURFEX framework of coupled models (for snow and ice, lake and sea, urban environment, forest and vegetation, heat and moisture fluxes in the soil etc.) is used ALADIN/AROME. As the first version of ALARO-1 is now available some effort should be put to SURFEX implementation. Link between ALARO-1 and SURFEX should be checked, some adaptations are probably needed, after validations should start.

Validation and sensitivity study of the parameterization of orographic shadowing in radiation with respect to the primary (radiation fluxes, temperature) and secondary (convection, low stratus in valleys, local circulation) will be done.

Sub-action: ALARO-1vA preparation for the operational use

Contributors: R. Brožková (Cz), N. Pristov (Si), C. Wittmann (At), M. Derková (Sk), M. Szücs (Hu), M.Tudor (Hr), S.Briceag (Ro)

Efforts: 6 months

Documentation, deliverable: national posters at ALADIN workshop, ALADIN/HIRLAM Newsletter; code in cy40t1 and cy41t1

Status:

ALARO-1vA is in the operational use in CHMI since January, while validation is ongoing or is planned in other meteorological services. In Austria, comparison between ALARO-0 and ALARO-1vA was done for re-runs (00UTC) for whole year 2014. Near surface temperature and relative humidity is improved in ALARO-1vA, BIAS is smaller, RMSE is similar. The problematic is wind forecast, especially in the afternoons and in near surface layer (100 m). Precipitation scores show ambivalent results for winter and summer. In summer, there is less overestimation during day but more underestimation during night for ALARO-1vA. In

winter, ALARO-1vA has better results overall, especially in Alpine Region there is less underestimation of precipitation amounts. In general, precipitation pattern is very similar, but in ALARO-v1A peaks have higher values (convection, mountains), while moderate/light amounts are reduced. ALARO-1 has better timing of convective diurnal cycle (triggering little bit later during day).

Subjective evaluation for 4 case studies with precipitation from August 2015 was done Romania. Performance of both simulations (ALARO-0 and ALARO-1vA) regarding precipitation are quite similar. They will continue with verification. Their plan is also to use cy40, as they have problems with cy38 on their HPC. Wind in the lower atmosphere (up to 600 m above surface) from the ALARO simulations was compared with SODAR measurements at the Otopeni airport for the period May-July 2014. The wind speed is underestimated in the model, while wind shear change with height is quite comparable. The wind speed during the daytime is well simulated (when air is better mixed, convective activity) while during the night time is a little bit weaker.

In Slovenia, comparison of ALARO-0 and ALARO-1vA was done for few months, in winter cold BIAS of 2m temperature is reduced, while summer maximum 2m temperature forecast are still underestimated and minimum values are overestimated. Their plan is to use ALARO-1vA in the operational suite and to re-compute forecasts for the period of few years.

Model set-up (ALARO-0) with higher horizontal resolution is in parallel e-suite in Slovakia (4.5 km, 63 model levels, 4 runs per day). With the same set-up the ALARO-1vA physics package was validated for the two periods (10 days in Feb/March 2015 and 14+12 days in July/August 2015), results are mostly neutral. This set-up (4.5 km, 63 levels, ALARO-1 physics) is going to be their next operational application.

Verification of ALARO-1vA at 8 km resolution is ongoing in Hungary. First results for one month period (August 2015) are promising. With the additional local modifications better verification scores for 2 m temperature and humidity are obtained.

In Croatia, they have additional operational model set-up (ALARO-0) with higher horizontal resolution (4 km, 73 model levels, only 00 run, forecast range 72 hours) since February 2015.

Sub-action: Coupling ALARO-1vA with SURFEX

Contributors: R.Hamdi (Be), I. Bašták Ďurán(Cz), J. Mašek (Cz), S. Briceag (Ro)

Efforts: 1 months

Documentation, deliverable: stay report, code modifications, poster at ALADIN workshop

Status:
Coupling of ALARO-1vA (cy38t1op3) and SURFEX (v7.2) is based on the same method as it was done for ALARO-0 (cy36) and SURFEX (v5) in the end of 2012. This work was also continuation of developments from the end of 2013 when first coupling with TOUCANS was introduced. To obtain this new version, small adaptation was needed in ACRANEB2 radiation code, more changes were required in SURFEX and few in TOUCANS code.

The interface between TOUCANS and SURFEX is done through drag turbulent coefficients (pcd, pcdn). As in TOCUCANS same stability functions are used for upper air and at surface, these functions has to be included also in SURFEX part of computation (are used under key LDRAG_COEF_ARP=true). Various test were performed, values of drag coefficient, roughness length were compared for different set-ups and influence of 2m temperature, relative humidity and 10 m wind.

Further scientific validation is needed to investigate more in detail the effect of the tiling approach inside SURFEX on the boundary layer when switching on the TOUCANS scheme.

Code ALARO-1vA (cy38t1op3) and SURFEX (v7.2) is available in the code system at CHMI in Prague, technically is working. The implementation in the code cy40t1_bf.05 with SURFEX (v7.3) was examined, validation is ongoing. The setup for ALARO-1 with SURFEX has been implemented also into HARMONIE system (harmonie-40h1_alaro1_surfex) and was tested with three different compilers (xlf,gnu,intel) on a small 50x50 domain during HARMONIE system working week. A five day simulation runs were successful but the results were not the same with various MPI setups. The changes in the SURFEX part has to be checked as this problem does not appear in simulations without SURFEX.

Sub-action: Parameterization of orographic effects on surface radiation within SURFEX

Contributors: C. Wastl (At), M. Dian (Sk)

Efforts: 5 months

Documentation, deliverable: stay report, coded parameterization algorithm, presentation at ALADIN workshop; poster at ICAM, page https://hirlam.org/trac/wiki/ororad

Status:
The orographic radiation parameterization for short and long wave radiation fluxes was coded (implemented under SURFEX part) in 2014, its validation was ongoing in 2015.

The scheme is based on high resolution topography data and takes into account shadowing effects of orography on the short-wave (SW) and long-wave (LW) radiation fluxes at the surface. In general there are 3 different effects: slope effect which takes into account

angle/direction of slope with respect to sun and influences solar (SW) direct radiation; second is shadowing of direct solar radiation by orography (shadow effect)and also and influences solar (SW) direct radiation; third is sky view effect (reduced fraction of sky visible) which results in an altered short wave diffuse radiation and altered long wave radiation fluxes.

Slope effect leads to an increase of short wave radiation flux at the sunny slopes and a decrease on the shady slopes, while shadowing of surrounding obstacles has a significant effect in the morning and evening hours. On the other hand, sky view effect on global solar radiation (due to reflections at surrounding slopes) is quite small.

The dominant effect during the night has sky view factor (the down welling long-wave radiation flux is enhanced), especially in the valleys. A very strong increase of LW radiation flux has been noticed, the consequence was significant increase of the 2m temperature. A new calculation for sky view factor (referring to Manners et al.,2012: Radiative transfer over resolved topographic features for high-resolution weather prediction) was implemented. The warming effect of sky view effect during night is now much smaller and the 2 m temperature BIAS decreased for almost all Alpine stations.

Tests have been made on the 2.5km AROME grid (operational at ZAMG) and on the 1 km grid where the effect is generally higher. The evaluation of several case studies and a longer period verification has already indicated a strong benefit of this scheme. The ororad scheme is now in a test phase at ZAMG (e-suite) and Météo-France.

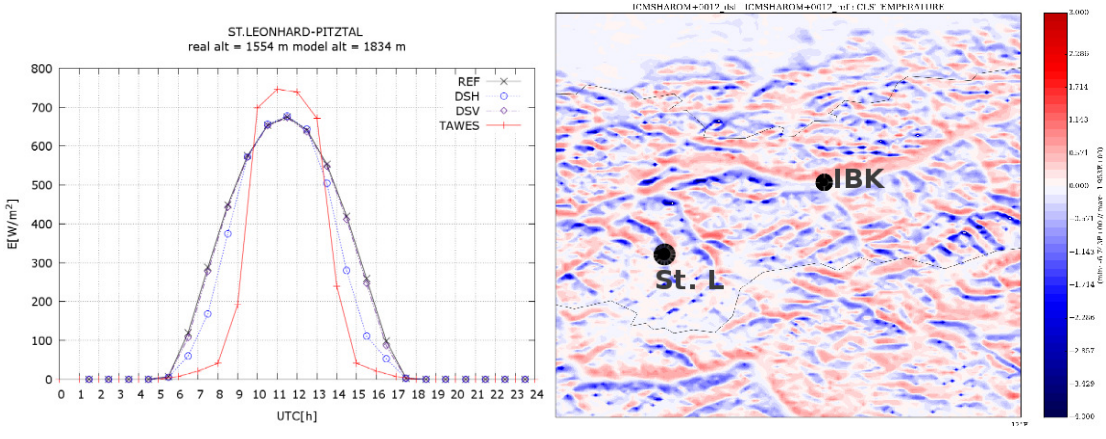

Figure 4: Left: Comparison of measured and modelled SW radiation flux (hourly mean values) at the station St. Leonhard/Pitztal for March 12, 2014. Red curve shows the station observation (TAWES), black curve the reference AROME run without ororad (REF), blue one is for shadow effect only (DSH), magenta one for sky view effect (DSV). Right: 2m temperature difference ororad – REF for 12 UTC at March 12, 2014 in the area of Tyrol (12 hour forecast). Black dots show the location of the capital city of Innsbruck (Ibk) and of the station St. Leonhard/Pitztal (St. L).

The ororad scheme shows a significant decrease of global radiation flux in the morning and evening hours (Figure 4 left), when the station is shadowed by surrounding mountains. The slope and aspect effect becomes obvious when looking at the 2m-temperature plot (Figure 4 right). Sunny slopes are heated (< 3°C) while shady slopes are cooled up to -4°C compared to the reference run without ororad.

Action/Subject: **The ALARO-1 version**

Description and objectives:

The first ALARO-1 version (ALARO-0, ACRANEB2, TOUCANS, some updates in microphysics) is available for validation and pre-operational testing. Next step is to assemble the unsaturated downdrafts (an extra extension for the 3MT scheme), and if developments are ready also improved description of cloud cover and prognostic graupl.

In the second stage then all other planed developments; i.e. CSD, TOUCANS evolution, prognostic graupl, thermodynamic adjustment, unified cloud treatment (in radiation, shallow convection, thermodynamic adjustment and 3MT). CSD stands for the complementary sub-grid draft (research work of Luc Gerard, including both up- and down- drafts) scheme which enable a more realistic transition from parameterized to explicit convection when going to higher resolutions. Tuning of this scheme in the ALARO-1 environment will be needed.

The validation will be in the range 5 km to 2 km and suitable validation testbeds (common with AROME and ARPEGE) for facilitating cross testing of various parameterizations should be also prepared.

Contributors:

Efforts:

Documentation, deliverable:

Status:

Luc Gerard phased his developments (non saturated downdraft and CSD) ALARO-1 library at CHMI. He is continuing his research, he submitted a paper: Gerard, L., 2015: Bulk mass-flux perturbation formulation for a unified approach of deep convection at high resolution. Mon. Wea. Rev., 143, 4038–4063.

Nothing was done on LACE side, CSD code is still changing and improving, should be also cleaned to become more transparent before entering official code cycle.

Action/Subject: Interfacing physics parameterizations

Description and objectives:

Impact study and validation of the physics-dynamics interface has high priority in ALADIN community. Scientific and practical constrains for redesign of physics interfaces (APL_AROME and APLPAR), which should enable the various physics packages (and also to exchange their individual parameterization schemes) are proposed. Actions are spread among many people, LACE contribution is to adopt ALARO part of computations in APLPAR routine. Radiation scheme in already in proper shape, code linked to turbulence and shallow convection should be analyzed and adopted, Very demanding part on 3MT will follow after.

Proposed contributors, Estimated efforts: *R. Brožková (Cz), I. Bašták Ďurán(Cz), 1 month*

Status:

Nothing new. A new physics-dynamics interface was extensive tested with AROME in 2015.

Action/Subject: Various products for users (forecasters)

Description and objectives:

Many requests from the user side, mainly forecasters, asking for additional forecast parameters has arrived. For this new features should be coded in post-processing part which would enable output of model fields. Continuation of this topic is foreseen on the base of good experience with enlarged convection diagnostics. The methods for lightening diagnostics have still to be evaluated and final solution should be proposed. Additional diagnostic meteorological parameters can be added: UV index, icing parameter, freezing rain, snowfall line, computation of real snow height.

Proposed contributors, Estimated efforts: *J. Cedilnik (Si), C. Wittmann (At), 1 month (0.5 month LACE stay)*

Status:

No new development, planed research stay was cancelled.

The convection diagnostic package was implemented in Romania, but was not tested yet. Some of its products are used in Austria and Slovenia. Lightning parameterization is included into parallel AROME e-suite in Austria.

Action/Subject: **Very Fine Resolution Experiments**

Description and objectives:

More and more teams are now able to perform VFR experiments with ALADIN NH-based models (with AROME and ALARO physics, within or without HARMONIE framework).

Some teams have started experiments at higher horizontal resolutions with AROME, experiments can be done now also ALARO-1 package (to be used also at the kilometric and hectometric scales). Several aspects on high resolution should be investigated (low stratus in valleys, initiation of convection over orography, etc.).

Study of the turbulence in the grey zone (resolved and parameterized description of eddies) is performed as part of PhD work of Dávid Lancz. The aim is to modify the EDKF scheme used in AROME in such way that parametrization of non-local eddies in the planetary boundary layer extinguish with higher horizontal model resolution and are handled by the model's dynamics.

The influence of orographic shadowing in radiation can be evaluated also at higher resolutions.

Contributor, Estimated efforts: D. Lancz (Hu)

Effort: 5.5 (1 month LACE stay)

Documentation, deliverable: stay report, presentation at ALADIN workshop

Status

EDKF modification were firstly tested inside prepared idealized AROME runs for the IHOP and ARM cases. Modification moves the results in the desired direction (Figure 5 left). The test and validation in real 3D case is done with AROME in 1km resolution (Figure 5 right) as the effect of the modification is seen only at higher resolutions. Results of these simulations can not beat those of operational AROME 2.5 km resolution but they indicate that the modification has slight, although not very clear, improvement. It is expected that positive effect will be better seen in planed simulations at 500 m resolution. Tuning should also be done and very probably additional modification will be needed.

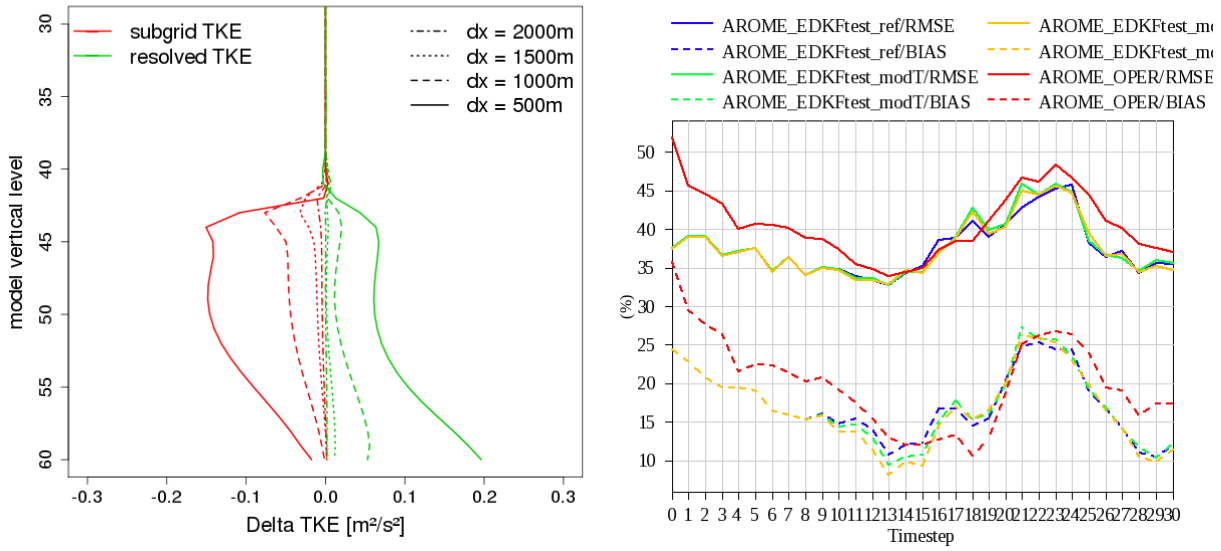

Figure 5: left: differences of the subgrid (red) and resolved (green) mean TKE profiles between the reference and the modified idealized AROME simulations at various resolutions for the IHOP case at the end of simulations (415 minutes); right: BIAS and RMSE of the cloudiness for the 2.5 km operational AROME (red), 1 km test reference AROME (blue) and the modified AROME with 2 different settings (green and orange) for a period 1-15 June 2015 over Hungary.

3 List of actions, deliverables including status

Subject: Turbulence scheme TOUCANS

Deliverables: documentation, coded algorithm for shallow convection

Status: ONGOING

Subject: Radiation scheme

Deliverables: paper published in QJRMS

Status: ONGOING

Subject: Cloud scheme

Deliverables:

Status: ONGOING

Subject: 1D2D turbulence scheme

Deliverables: -

Status: POSTPONED

Subject: Operational applications: from ALARO-0 to ALARO-1, SURFEX

Deliverables: interface ALARO-1vA (cy38t1op3) and SURFEX (v7.2)

Status: PERMANENT

Subject: The ALARO-1 version

Deliverables:

Status: PENDING

Subject: Interfacing physics parameterizations

Deliverables:

Status: PENDING

Subject: Various products for users (forecasters)

Deliverables:

Status: PENDING

Subject: Very Fine Resolution experiments

Deliverables:

Status: ONGOING

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4 Documents and publications

List of reports:

Ivan Bašták Ďurán, 2015: TOUCANS documentation (53 pages)

Dávid Lancz: Modified PM09 parameterizations in the shallow convection grey zone, RC LACE stay report, Toulouse, 2-27 February 2015

Radmila Brozková: Shallow Convection Cloudiness, RC LACE stay report, Toulouse, 20 April - 20 May 2015

Viktória Homonnai: Validation and testing of newest modifications in the ICE3/ICE4 microphysics scheme, RC LACE stay report, Toulouse, 2 – 21 November 2015

Martin Dian: Parameterization of orographic effects on surface radiation in AROME, RC LACE stay report, Vienna, 20 April - 22 May 2015

Neva Pristov: ALARO-1 related issues, RC LACE stay report, Prague, 6-11 December 2015

Rafiq Hamdi: Coupling SURFEX_V7.2 to ALARO-1 baseline version (CY38T1OP3), stay report, Prague, 22 February - 6 March 2015

Scientific papers:

Mašek J., J.-F. Geleyn R. Brožková, O. Giot H. O. Achom and P. Kuma, 2015: Single interval shortwave radiation scheme with parameterized optical saturation and spectral overlaps, Quarterly Journal of the Royal Meteorological Society, DOI: 10.1002/qj.2653

ALADIN - HIRLAM Newsletter:

Clemens Wastl, Alexandre Mary, Yann Seity, Laura Rontu, Christoph Wittmann, 2015: Parameterization of orographic effects on surface radiation in AROME-SURFEX, ALADIN-HIRLAM Newsletter, No 5

Radmila Brožková, 2015: ALARO-1 first operational application, ALADIN-HIRLAM Newsletter, No 5

List of presentations:

Joint 25th ALADIN Workshop & HIRLAM All Staff Meeting, 13-17 April 2015, Helsingor, Denmark http://www.cnrm.meteo.fr/aladin/spip.php?article269

Neva Pristov, Ján Mašek: ALARO status overview with emphasis on ACRANEB2 radiation scheme
Radmila Brožková : ALARO-1: first operational implementation
Ivan Bašták Ďurán: Operational version of turbulence scheme TOUCANS
Christoph Wittmann : Parameterization of orographic effects on surface radiation in AROME
Dávid Lancz : Modification of EDKF parametrization in the grey zone
National posters

Clemens Wastl, Christoph Wittmann (ZAMG); Alexandre Mary, Yann Seity (Météo France); Laura Rontu (Finnish Meteorological Institute), Martin Dian (Slovak Hydromet. Institute) Parameterization of orographic effects on surface radiation in AROME, 33rd International Conference on Alpine Meteorology, 31 Aug – 04 Sep 2015, Innsbruck

Neva Pristov: ALARO Physics Developments, 37th EWGLAM & 22nd SRNWP joined meetings, 5 - 8 October 2015, Belgrade, Serbia

Jan Mašek: Recent ACRANEB2 related activities and plans, 8th HIRLAM Radiation Working Week, Estonian Meteorological Service, Tallinn, 23 -26 November 2015

Viktória Homonnai: OCND2 experiments on the Hungarian domain with AROME cycle38, Cloud working week, SHMI, Norrköping, 23 -25 November 2015

5 Activities of management, coordination and communication

Meetings:

- 25st ALADIN Workshop and & HIRLAM All Staff Meeting, 2015, Denmark (participation of Neva Pristov).
- 37th EWGLAM & 22nd SRNWP joined meetings, 2015, Serbia (participation of Neva Pristov).
- HARMONIE training, September 2015, Norrköping (presentations on TOUCANS, 3MT by Neva Pristov)

6 Summary of resources/means

Subject/Action/deliverable	Resource		LACE		ALADIN Flat-rate	
	planned	realized	planned	realized	planned	Realized
TOUCANS	8	10	0.5	1*		
Radiation	7	7.5	*0.5*	/		
Cloud scheme	3	1.5	0.25	0.25		
1D2D turbulence	2	-				
ALARO-0/ALARO-1/SURFEX	10	12	1	1*	0.5	0.5
ALARO-1	6	-	*1*	-	1.25	0.25
Physics interface	1	-				
Additional fields	1	-	0.5	/		
VFR experiments	8	5.5	1	1		
Microphysics	-	1	-	0.75		
Total:	**39**	**37.5**	**3.75*+1.5***	**4**	**1.75**	**0.75**

*originally planed is substituted; italic - planed without candidate

LACE scientific stays:

Dávid Lancz: Study of the turbulence grey zone (AROME 1km runs), Toulouse, 1 month, 2-27 February 2015

Martin Dian: Validation of orographic radiation parameterization, Vienna, 1 month, 20 April - 22 May 2015

Ivan Bašták Ďurán : Discussion related to turbulence description in ALARO/AROME, Budapest, 0.5 month (cancelled)

Christoph Wittmann: Additional forecast weather parameters, Ljubljana, 0.5 month (cancelled)

Neva Pristov: ALARO-1 related issues, Prague, 1 week, 6-11 December 2015

Radmila Brožková: Shallow Convection, Toulouse, 1 month, 20 April - 20 May 2015 (new)

Viktoria Hamonnai: Validation and testing of newest modifications in the ICE3/ICE4 microphysics scheme Toulouse 3 weeks, 2-21 November 2015 (new)

ALADIN Flat-Rates Stays

Michiel Van Ginderachter: Micro-physics in ALARO, Prague, 1 month (cancelled)

Luc Gerard: Convection, Prague, 0.25 month, 6-11 December 2015

Rafiq Hamdi: SURFEX in ALARO, Prague, 0.5 month, 22 February - 6 March 2015