



The Training Board (in the following denoted as 'TB') is pleased to report that the network training of the GREENCYCLESII (in the following denoted as 'GCII') programme has been tremendously successful, and all proposed training elements were offered by the host institutions according to the specified details given in Annex I of the grant agreement. Below we report on the individual elements of the training provided during 2010-2013.

1. GREENCYCLESII ECTS System

In collaboration with the host institutions, and compliant with the customs of European research institutes, the TB has developed, implemented, and monitored a network-wide ECTS (European Credit Transfer and Accumulation System) -based system of training credits. The TB deemed it necessary that the GCII ECTS credit system be as compatible as possible with the training systems of the degree-awarding host institutions, where the network Fellows were to be awarded their PhD degrees, and developed the system in close collaboration with the supervisors of the Fellows. Early-Stage Researchers ('ESRs') were required to attain 60 credits from fieldwork, coursework, literature study, and research in each 12 month period of their Fellowship. Credits were allocated by the local supervisors, with one credit awarded for each 25 hours of study, or equivalent. Formal training events were allocated credits, to be received by network Fellows and outside researchers on successful completion of each event. According to EU standards, Training Workshops ('TWs') were allocated 3 credits, Mini-Conferences ('MCs') 2 credits, and the network summer school was allocated 3 credits. Scientific talks and poster presentations at national and international meetings, or for outreach and teaching activities, were allocated 1 credit each. Certificates were provided to all successful ESRs and non-network participants. All ESRs met the requirement for a total amount of 60 credits for each year of their assignment, with many of the Fellows attaining more than the required minimum. Fellows were required to earn a minimum of 5% of their credits through complementary training. Complementary training activities ranged from language courses to training on interpersonal skills and career development, with a wide variety of courses attended by the Fellows. Over the three years, we are pleased to report that Fellows in fact obtained a median of 6.8% of ECTS credits through complementary skills training (mean: 11.23%), thus greatly exceeding the minimum requirement of 5%. 'Science-related courses account for the most 'complementary' skills training undertaken by our Fellows. Table 1 below summarizes how complementary skills credits have been accrued.

Table 1: Percentage of ECTS credits acquired during complementary training across the GCII network

	% of total ECTS credits acquired across the network	Examples of courses included in these categories:-
Language Courses	1.05	
Communication Courses	1.74	'Presentation Skills', 'Poster Design Hints and Tips', 'Graphic Design', 'Working with others to write collaboratively', 'Getting the most out of conferences', 'Reviewing papers', 'Writing your Thesis', 'Using Adobe Illustrator', 'Preparing for your viva'.
Personal Development Courses	0.89	'Effective Learning Skills', 'Reflective Reporting', 'Experiential Learning', 'Leadership Skills', 'Email Management Training', 'Project Management', 'Sustaining Peak Performance in Research', 'Mapping your career path', 'Events Organisation', 'CV Writing', 'Creative Job Hunting', 'Introduction to Improvisation Performance', 'Interview Training', 'Time Management', 'Job applications Beyond Academia',
Research Development Courses	0.76	'Research Methods', 'Introduction to the Research Sector', 'Risk Assessment', 'Research Design', 'Progress Reporting', 'Supervision Training', 'Making the Most Of IP', 'Research methods and skills for Climate Change Sciences'
Science-related Courses	5.51	'Statistical Analysis Training', 'FORTRAN Training', 'Data Visualisation Tools', 'Data Mining', 'Using R Analysis Software', 'Tree Climbing for Research Purposes', training in various specialist pieces of equipment not directly associated with Task/Project, 'Fieldwork Preparation', 'Using LaTeX', 'Introduction to Visual Basic Language'
Other (Host specific, etc.)	0.16	Induction courses for Host Institutions/ Departments, Health and Safety courses specific to Host Institutions.

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Overall, most credits were acquired in Year 2 of the ESRs' Fellowships, which likely coincided with the time when the Fellows had settled into their posts (Table 2). Most language credits were acquired in Year 1, most likely linked with the relocation of the Fellows to new host countries. Most credits for communications and personal development courses were acquired in Year 3 of the ESRs' Fellowships, related to the Fellows actively planning the continuation of their career. Most ECTS points for 'science-related' courses were acquired in Year 1 of the ESRs' Fellowships, when they had the most time free to explore/develop new skills and had the most training needs specific to their task. These courses included the development of techniques for scientific writing, literature management, or to learn new software packages for scientific analysis and visualisation.

Table 2: Complementary credits accrued over the three years of the project

	TOTAL	Language	Communications	Personal Development	Research Development	Scientific-related	Other
ECTS acquired	4358.2	46.8	76	39	33	240	7
Y1	1446.6	23.8	16.5	8	9	64.5	4.5
Y2	1521.6	11	32	5	6.5	133	2.5
Y3	1346.0	12	27.5	24	17.5	35.5	0
(Y4)	44.0	0	0	2	0	7	0

2. Secondments

A record of the secondments signed off by the head of the TB with a brief account of the main outcomes of each stay is attached to this report (GCII-P2-Secondments). While all Fellows undertook their secondments, several adjustments to the planned secondment schedule were necessary. For 11 Fellows (out of a total of 30), the secondment time had to be shortened, postponed, or split into several time periods due to conflicts with other ongoing field work, conference activity, family situation, or due to the planned task being completed in a shorter time period than what was previously foreseen. Two secondments had to be postponed till a later date than planned, and one had to be altered due to legal conflicts with the contract of visiting researchers at the host institution. Two secondments were moved to different host institutions than previously planned, due to changes in the scientific activities of the Fellows. Lastly, one secondment did not take place due to one fellow resigning from his contract. Overall, we conclude that the changes in secondment duration, sequence and adaptation to the individual Fellows schedule were highly beneficial to the network, as all Fellows report significant positive outcomes of their Fellowships. The TB is proud to report that the secondments resulted in 3 published papers and 1 published technical report, 2 submitted papers, and 10 papers in preparation, as well as 4 new model and/or model components and 1 new dataset. Most Fellows also report fruitful discussions and the acquisition of new and indispensable skills during their secondment period. Thus, we conclude that it was of utmost importance that secondments within ITNs were viewed plastic and flexible instruments of opportunity for collaboration and learning rather than strict and unchangeable units of scientific exchange, and that these opportunities have been exploited by all the Fellows to the benefit of the network. The striking success of these secondments also confirms the close ties that have been made between the individual host institutions and the strong collaborative element of this network.

3. Training workshops, mini-conferences, conference sessions, and network meetings

The following seven **training workshops** were successfully organised by the GCII network for network ESRs and ERs (Table 3):

TW1: "Statistical analysis and synthesis of climate data", run by **ETH Zürich**

TW2: "Model benchmarking and data assimilation techniques", run by **MPG**

TW3: "Remote sensing of the Earth from space", run by **EST**

TW4: "Nitrogen cycling in the Earth system", run by **MPG**

TW5: "Earth system models at intermediate complexity", run by **PIK**

TW6: "The physiology of primary production in terrestrial and marine plants", run by **Imperial**

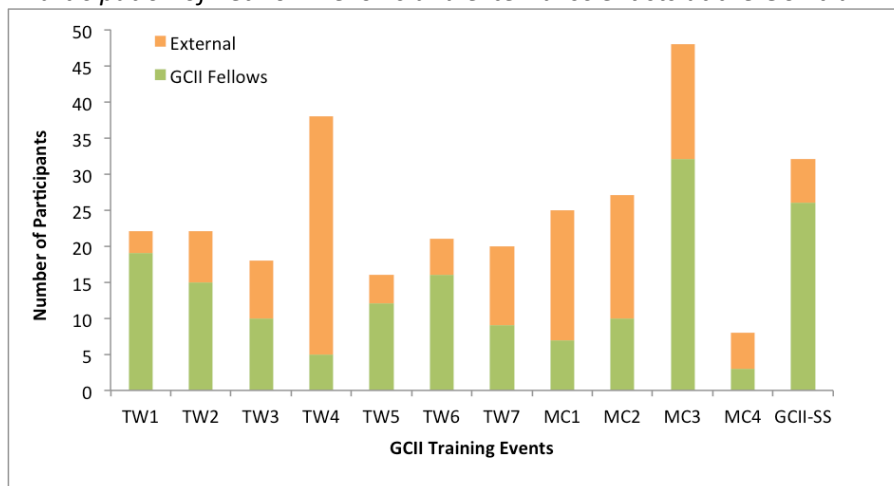
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TW7: “Developing and publishing re-usable scientific software tools and visualisations”, run by **MSRC**

These TWs were highly successful and attracted both a high number of international speakers and also a high number of interested non-network Fellows, who we were able to receive quality training in addition to our network Fellows.

Figure 1: Participation of network Fellows and external scientists at the GCII training events.



As well as the workshops proposed in the Annex I of our grant agreement, an additional highly successful workshop on "Synthesis of Feedbacks" was held in Bristol, UK in September, 2013, which will result in a high profile publication (Earth System biophysical and biogeochemical feedbacks, in preparation). Reports for the training workshops carried out during PM 1-24 can be found in the first Periodic Report, individual attachments for those conducted during this project period can be found as attachments (GCII-P2-Events-TW4/TW5/TW6/TW7). Credit certificates were issued for all TW participants by the TB after each TW, with the agreed number of credits allocated to the workshops.

The following four two day **mini-conferences** were organised by and for network ESRs and ERs, and consisted of a series of presentations from outside experts, network senior scientists, Fellows, and structured discussions and poster sessions (Table 4).

MC1: “High latitude processes and feedbacks”, run by **ULUND** (month 21);

MC2: “Impacts of climate change on marine ecosystems”, run by **ETH Zürich** (month 39);

MC3: “Evaluation of Earth system models using modern and palaeo-observations”, run by **UCAM-DGEOG** (month 33);

MC4: “Biosphere-mediated human impacts on the Earth system”, run by **PIK** (month 34).

Each MC reserved places for five fully funded non-network researchers, but most of the MCs were substantially larger and attended by international leaders in the respective fields. In total, 133 external people from 58 institutions and 17 nations attended these events. Figure 1 below summarizes the numbers of Fellow and non-Fellow participants at these events. On average, each GREENCYCLESII Fellow attended 5-6 of the 12 events that were offered, demonstrating the high motivation and great interest of the network Fellows in our training activities. All MCs resulted in high profile publications, either published or in preparation, which are listed below:

MC1: Parmentier F J W, Christensen T R, Sørensen L L, Rysgaard S, McGuire A D, Miller P A and Walker D A. 2013. The impact of lower sea-ice extent on Arctic greenhouse-gas exchange, *Nature Climate Change*, **3**, 195–202. [doi:10.1038/nclimate1784](https://doi.org/10.1038/nclimate1784)

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MC2: Meike Vogt, Nicolas Gruber, Laurent Bopp, Mehera Kidston, Olivier Aumont, Jorn Bruggeman, Erik Buitenhuis, Anna Cabre, Scott C. Doney, John Dunne, Stephanie Dutkiewicz, Marion Gehlen, Taketo Hashioka, Takafumi Hirata, Maria Kavanaugh, Jorge Martinez-Rey, Irina Marinov, William McKiver, Peter Landschuetzer, Charlotte Laufkoetter, Corinne Le Quéré, Colleen O'Brien, Sevrine Sailley, Beate Stawiarski, Alessandro Tagliabue, Sergio Vallina, Marcello Vichi, Christoph Völker, Ting-Ting Wang, Ben Ward, Yasuhiro Yamanaka, in preparation. Global scale lower trophic level marine ecosystem modelling – quo vadis?, to be submitted to Annual Reviews of Marine Science.

MC3: Foley A M, Dalmonch D, Friend A D, Aires F, Archibald A, Bartlein P, Bopp L, Chappellaz J, Cox P, Edwards N R, Feulner G, Friedlingstein P, Harrison S P, Hopcroft P O, Jones C D, Kolassa J, Levine J G, Prentice I C, Pyle J, Vázquez Riveiros N, Wolff E W and Zaehle S. 2013. Evaluation of biospheric components in Earth system models using modern and palaeo observations: the state-of-the-art. Biogeosciences, 10, 8305-8328. doi:10.5194/bg-10-8305-2013.

MC4: Vilain G, Mueller C, Ciais P, Weindl I, Lotze-Campen H and Feulner G., 2013. N2O emissions offset potential carbon gains of bioenergy production. Submitted to Biomass & Bioenergy.

Table 3: Fellow Participation in GCII Training Events

	TW1	TW2	TW3	TW4	TW5	TW6	TW7	MC1	MC2	MC3	MC4	GCII SS.
T1.1	✓		✓							✓		✓
T1.2	✓	✓	✓			✓				✓	✓	✓
T1.3	✓	✓				✓	✓			✓		✓
T1.4	✓					✓			✓			✓
T1.5			✓							✓		✓
T1.6	✓	✓	✓							✓		✓
T2.1	✓				✓				✓	✓		
T2.2	✓		✓			✓	✓		✓			✓
T2.3				✓	✓	✓			✓			✓
T2.4	✓		✓	✓		✓			✓	✓		✓
T2.5	✓					✓	✓		✓			✓
T3.1										✓		✓
T3.2	✓	✓		✓	✓	✓				✓		✓
T3.3	✓	✓		✓	✓	✓				✓		✓
T3.4	✓	✓	✓			✓	✓			✓		✓
T3.5		✓				✓				✓		✓
T3.6	✓	✓			✓	✓	✓			✓		✓
T3.7	✓	✓		✓						✓		✓
T4.1								✓				✓
T4.2a						✓		✓				✓
T4.2b							✓					
T4.3	✓	✓						✓		✓		✓
T4.4					✓	✓	✓	✓		✓		✓
T5.1		✓			✓					✓		✓
T5.2	✓	✓	✓		✓			✓		✓		✓
T5.3	✓	✓			✓		✓			✓	✓	✓
T5.4	✓	✓	✓		✓		✓			✓		✓
T5.5	✓	✓	✓			✓				✓		✓
T5.6					✓	✓				✓	✓	
T5.7					✓					✓		
TOTAL	19	15	10	5	12	16	9	5	6	23	3	26

Furthermore, as an additional training event, a **network session** was organised at the *EGU General Assembly 2013*. All science tasks were represented either as oral and/or poster presentations. In addition, presentations from senior scientists and ERs covered network-wide and work package themes. The GCII session at the EGU General Assembly 2013 included presentations by 26 GREENCYCLESII members and 14 non-network researchers. 3 ERs and 12 ESRs gave oral presentations, 2 ERs and 9 ESRs presented posters and the session also

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included one poster presented by the GCII Network Manager focussing on the overall project management of the Network.

Dedicated sessions during our **annual two-day network meetings** were used for network Fellows to present their research tasks and receive feedback from network senior scientists, the outside scientific expert, and other Fellows. All network events (TWs, MCs, and annual network meetings) were documented affectionately in an informal report in comic form, designed by the network Fellows (J. Martinez-Rey), that was circulated among the network Fellows. Figure 2 shows an excerpt from one of the comics on the occasion of the 2nd annual network meeting in Abisko, Sweden, in 2012 and documents well the interdisciplinary, creative, and imaginative forms of communication between Fellows that has been built up by our network. Where an atmosphere is constructive, open-minded and creative, learning will be maximized and scientific progress will be optimal.

Figure 2: Informal digestion of training provided by the network (courtesy J. Martinez-Rey).



4. Network summer school

One of the highlights of the training activities was the 10 day GCII summer school on “*Feedbacks in the Earth System: the state-of-the-art*”, organised in month 15 by partner **PIK** in the beautiful old town of **Peyresq** in the French Alps. The summer school was obligatory for all network Fellows, and 6 places were made available for researchers from outside of the network. Each day consisted of two morning lectures from both network and external experts, followed by discussions led by network senior scientists. In the afternoons, practical exercises on climate modelling, debates designed to deepen understanding, and a 3-day field work exercise on the meteorology, biology, and biogeochemistry of the surrounding natural environment was conducted. The evening ended with provocative talks by international experts that inspired the Fellows and invited critical thinking. A one-day excursion to the Observatoire de Haute-Provence, where summer school participants were informed about ongoing astronomical, terrestrial ecosystem, and climate change research at the station completed the summer school. The summer school was a major success, and was enjoyed not only by the Fellows but also by the organising committee. More information on the GCII summer school is available on the PIK website <http://www.pik-potsdam.de/news/public-events/archiv/greencyclesii>

5. External training: International conference and summer school attendance

Despite the time constraints arising from the huge amount of training occasions offered by the network, requiring a large degree of international mobility from the network participants, and sometimes conflicting with deadlines and deliverables of their day-to-day research projects, network Fellows showed great interest in external training events and engaged in the active dissemination of their work within the scientific community. In total, network Fellows attended 20 additional summer and winter schools and presented their work at 55 international conferences, workshops, and meetings.