



25 лет использования программного комплекса ЮНЕСКО БИЛКО для обработки и интерпретации спутниковых данных при обучении и подготовке специалистов

Сычев В.И. (РГГМУ)

Valborg Byfield, Tyler Christensen, Malcolm Dobson, Craig Donlon,
Alasdair Edwards, Ian Robinson, Vitaly Sychev, Dirk Troost, Christo Whittle

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Shaping the Future of the Oceans and Coasts
St Petersburg, 27 – 30 April 2010





25 years of Capacity Development in Coastal and Marine Remote Sensing with UNESCO Bilko

Valborg Byfield, Tyler Christensen, Malcolm Dobson, Craig Donlon,
Alasdair Edwards, Ian Robinson, Vitaly Sychev, Dirk Troost, Christo Whittle



Dear Vitaly, Nice to hear from you. Thanks for reminding us about Bilko being 25 this year - we should do something about it. I will try to find out what month it started, and perhaps do something about it on the web site. You are very welcome to use some of our IOC50 presentation for your celebrations in Russia.

Val.

February 29, 2012

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БИЛКО



Эдвард Мунк

Der Schrei der Natur («Крик природы»)

Использование
БИЛКО на
русском языке



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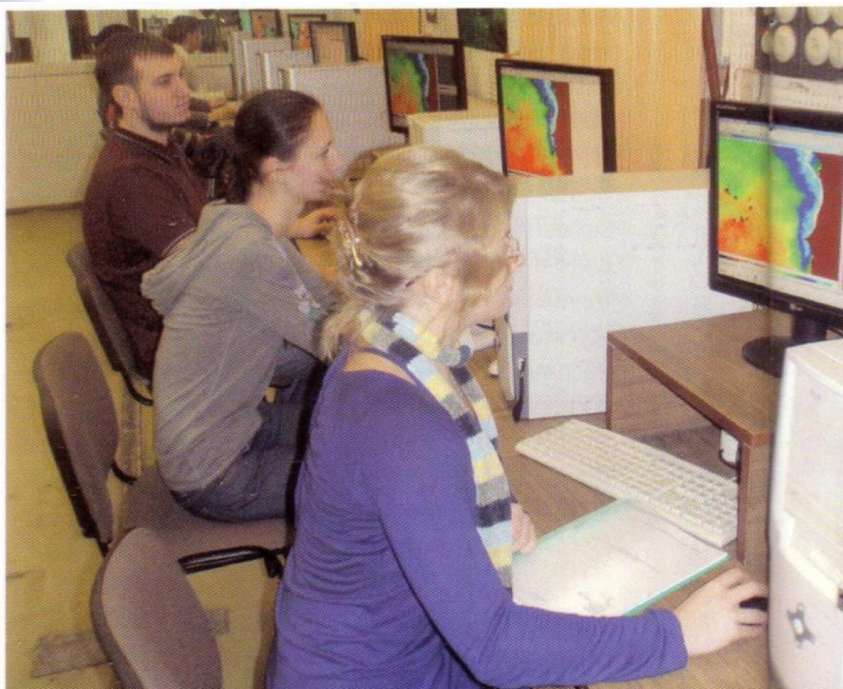




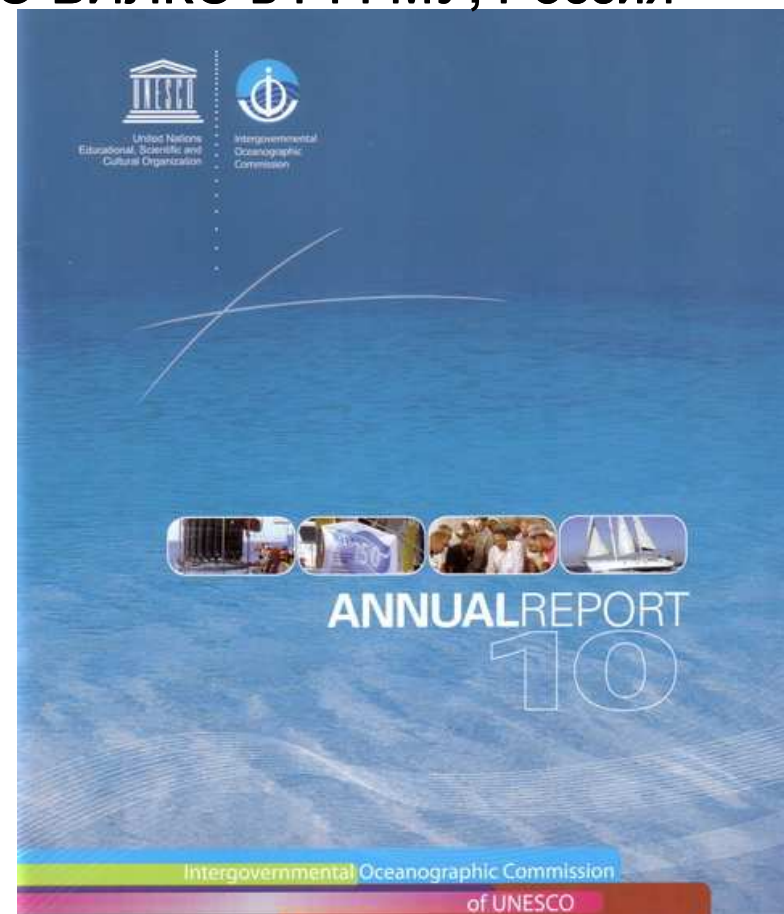
БИЛКО



Отчет МОК/ЮНЕСКО за 2010 г. Изучение и тестирование модулей ЮНЕСКО БИЛКО в РГГМУ, Россия



Studying and testing UNESCO BILKO software and modules, RSHU, St. Petersburg, Russian Federation



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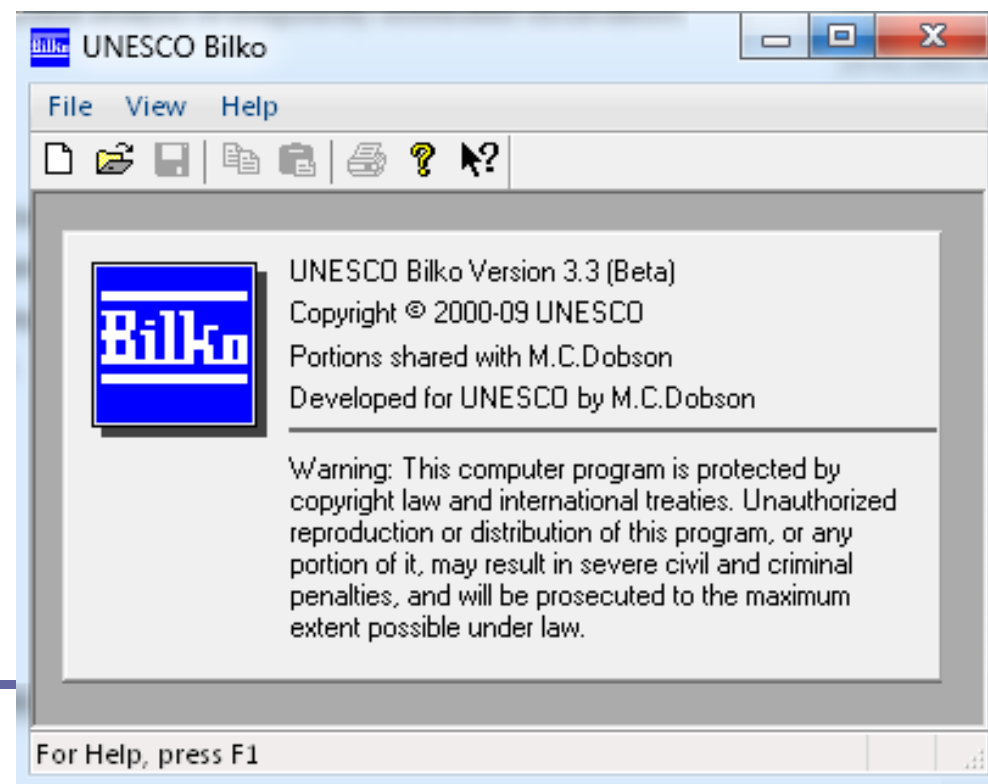
БИЛКО



ВВЕДЕНИЕ В ПРОГРАММНОЕ ОБЕСПЕЧЕНИЕ ОБРАБОТКИ ИЗОБРАЖЕНИЙ BILKO 3.2

Цели и задачи введения

Программное обеспечение *Bilko* для Windows предназначено для анализа цифровых изображений, а также для демонстрации операций, с помощью которых могут быть определены некоторые параметры цифрового изображения.





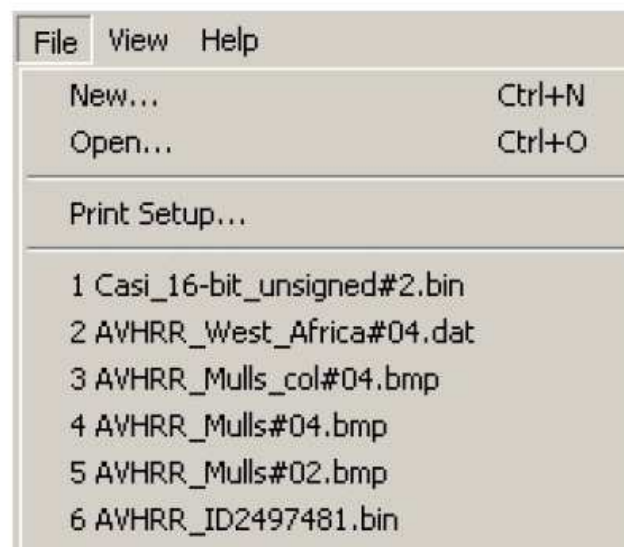
Использование БИЛКО на русском языке



2. Загрузка, просмотр и сохранение изображений

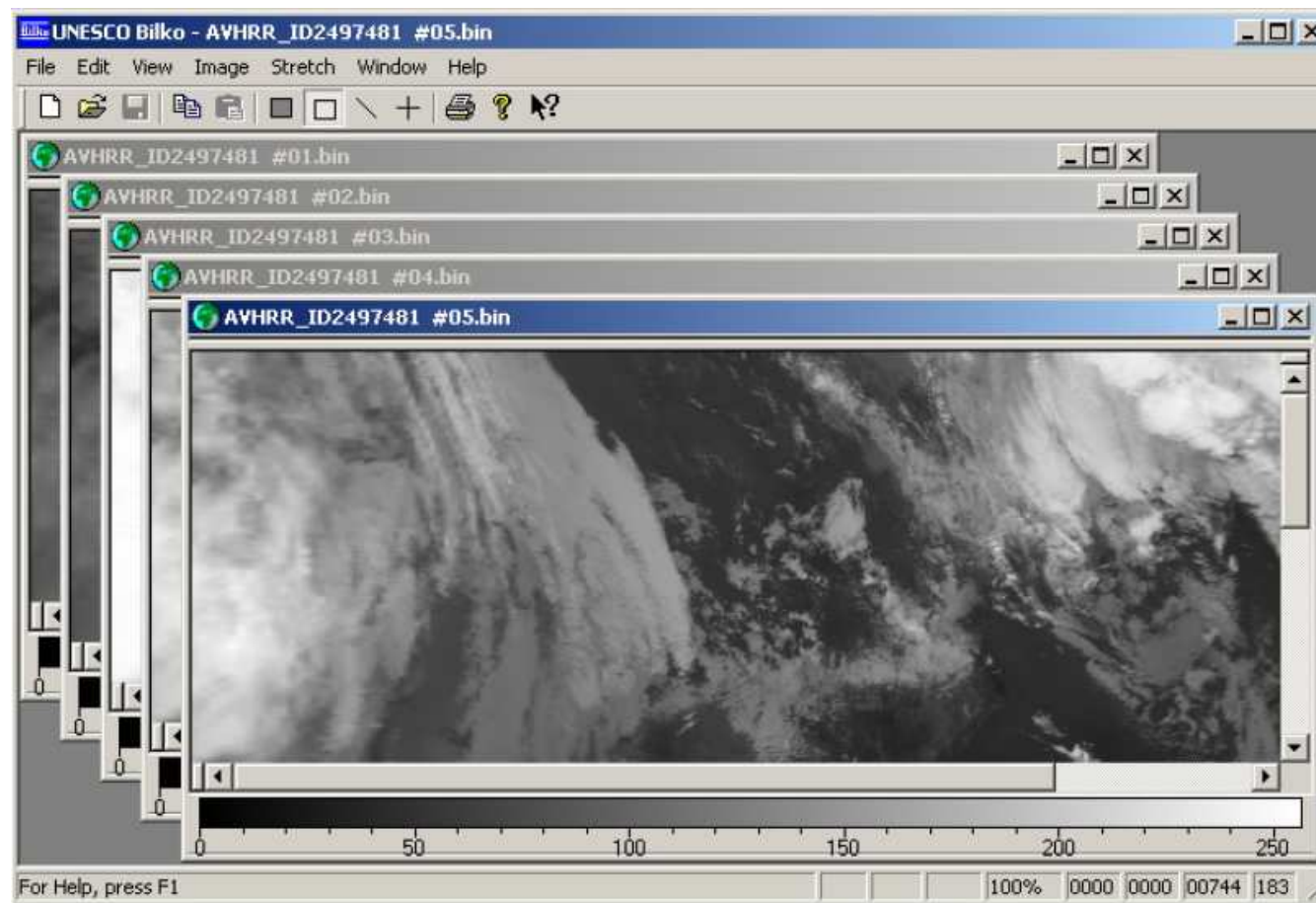
Операции в *Bilko* для *Windows* производятся над изображением, которое необходимо загрузить. В *Bilko* для *Windows* могут использоваться различные типы файлов (документов). Работая в компьютерной сети, следует предварительно выяснить, где находятся файлы изображений, палитр, шкал и другие документы *Bilko* для *Windows*. В этом случае в программе следует указать путь к этим файлам.

Действие: Нажмите левую кнопку мыши, установив курсор на разделе меню **File (Файл)**. Обратите внимание, что имена четырех последних вызывавшихся ранее для обработки файлов будут перечислены в меню **File** (см. рис. справа). Затем установите курсор на разделе **Open (Открыть)** и нажмите левую кнопку мыши, после чего откроется диалоговое окно **File Open (Открыть файл)**,





Использование БИЛКО на русском языке





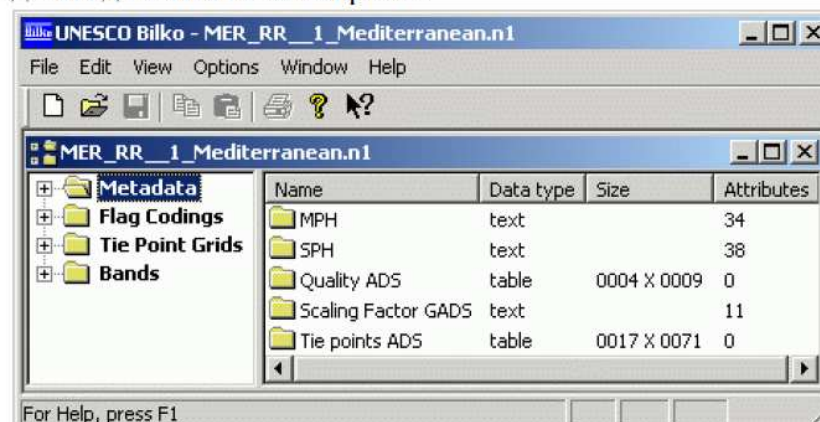
Использование БИЛКО на русском языке



Ввод файла **MER_RR__1PNPDK20030813_094018_00022_07591_4499.N1**

Для примера рассмотрим изображение с ассоциированными данными прибора MERIS (Medium Resolution Imaging Spectrometer - Спектрометр среднего разрешения) спутника EKA ENVISAT.

Откройте файл **MER_RR__1_Mediterranean.n1** – изображение, полученное с помощью прибора MERIS, центральной части Средиземного моря. Полное название файла (в оригинале: **MER_RR__1PNPDK20030813_094018_00022_07591_4499.N1**). В открытом окне показана иерархическая структура файла N1. В левой части перечислены папки: изображения в различных каналах (Bands), коды меток (Flag Codings), точки для географической привязки изображения (Tie Point Grids) и метаданные (Metadata). Папка Metadata содержит в себе еще пять папок, которые показаны в правой части окна. Откройте эти папки двойным нажатием левой клавиши мыши (или нажмите правую клавишу мыши, а затем Open Items). В папке SPH вы найдете информацию о том, где и когда были получены изображения, количество каналов и их характеристики и т.д. Используйте приведенные сведения для ответа на вопросы.





Использование БИЛКО на русском языке



UNESCO Bilko - MER_RR__1_Mediterranean.n1

File Edit View Options Window Help

MER_RR__1_Mediterranean.n1

- Metadata
- Flag Codings
- Tie Point Grids
- Bands
 - radiance_1
 - radiance_2
 - radiance_3
 - radiance_4
 - radiance_5
 - radiance_6
 - radiance_7
 - radiance_8
 - radiance_9
 - radiance_10
 - radiance_11
 - radiance_12
 - radiance_13
 - radiance_14
 - radiance_15
 - l1_flags
 - detector_index

Name	Data type	Size	Attributes
radiance_1	16-bit unsigned integer	1121 X 1121	7
radiance_2	16-bit unsigned integer	1121 X 1121	7
radiance_3	16-bit unsigned integer	1121 X 1121	7
radiance_4	16-bit unsigned integer	1121 X 1121	7
radiance_5	16-bit unsigned integer	1121 X 1121	7
radiance_6	16-bit unsigned integer	1121 X 1121	7
radiance_7	16-bit unsigned integer	1121 X 1121	7
radiance_8	16-bit unsigned integer	1121 X 1121	7
radiance_9	16-bit unsigned integer	1121 X 1121	7
radiance_10	16-bit unsigned integer	1121 X 1121	7

Open Items
Open Connected
Open Properties

MER_RR__1_Mediterranean radiance_1.n1

description = TOA radiance band 1
scaling factor = 0.009332661516964436
scaling offset = 0
unit = mW/(m²*sr*nm)
spectral band index = 1
bandwidth = 9.93
wavelength = 412.545

Open selected items

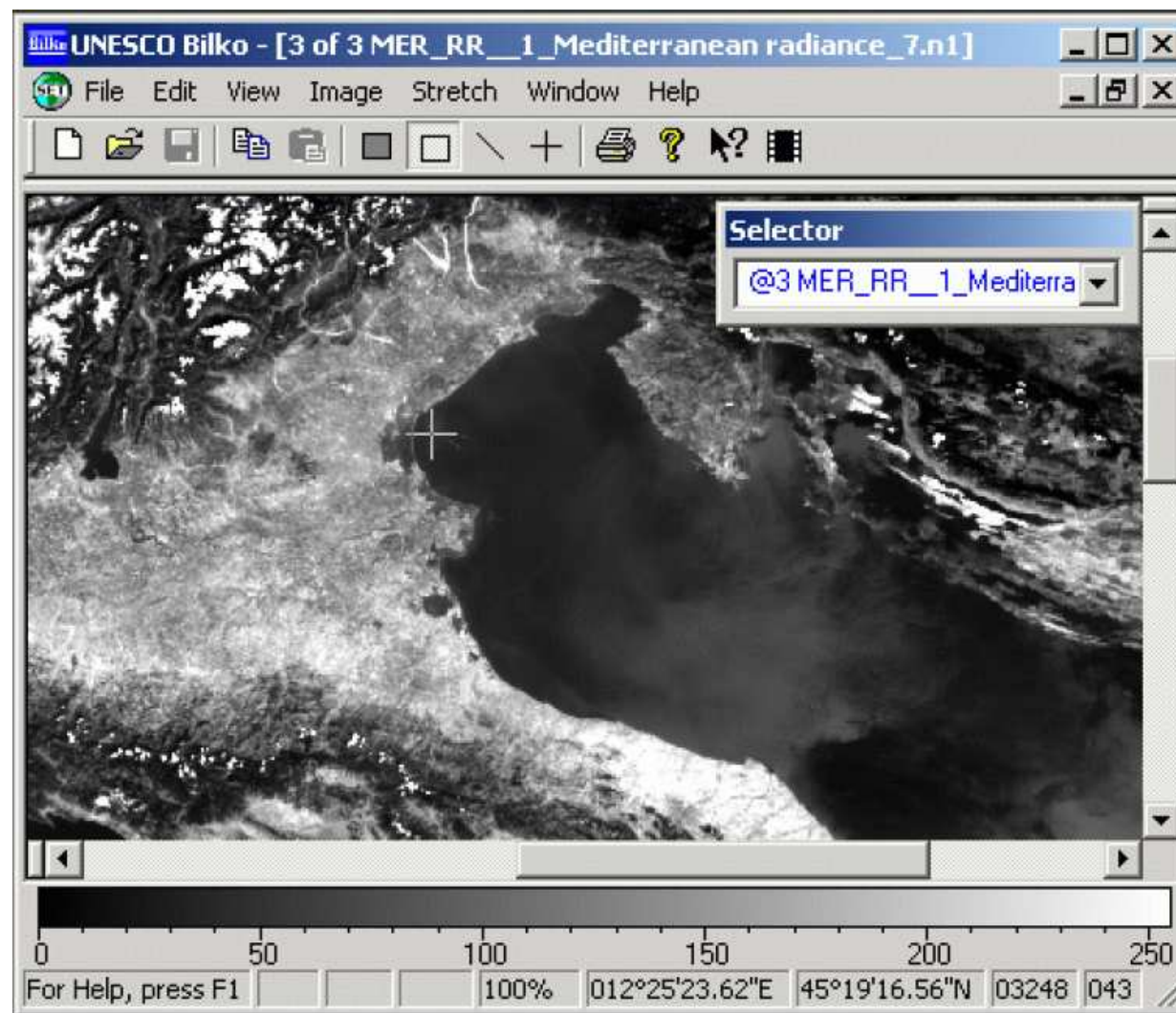




Использование БИЛКО на русском языке



Файл данных Envisat/MERIS



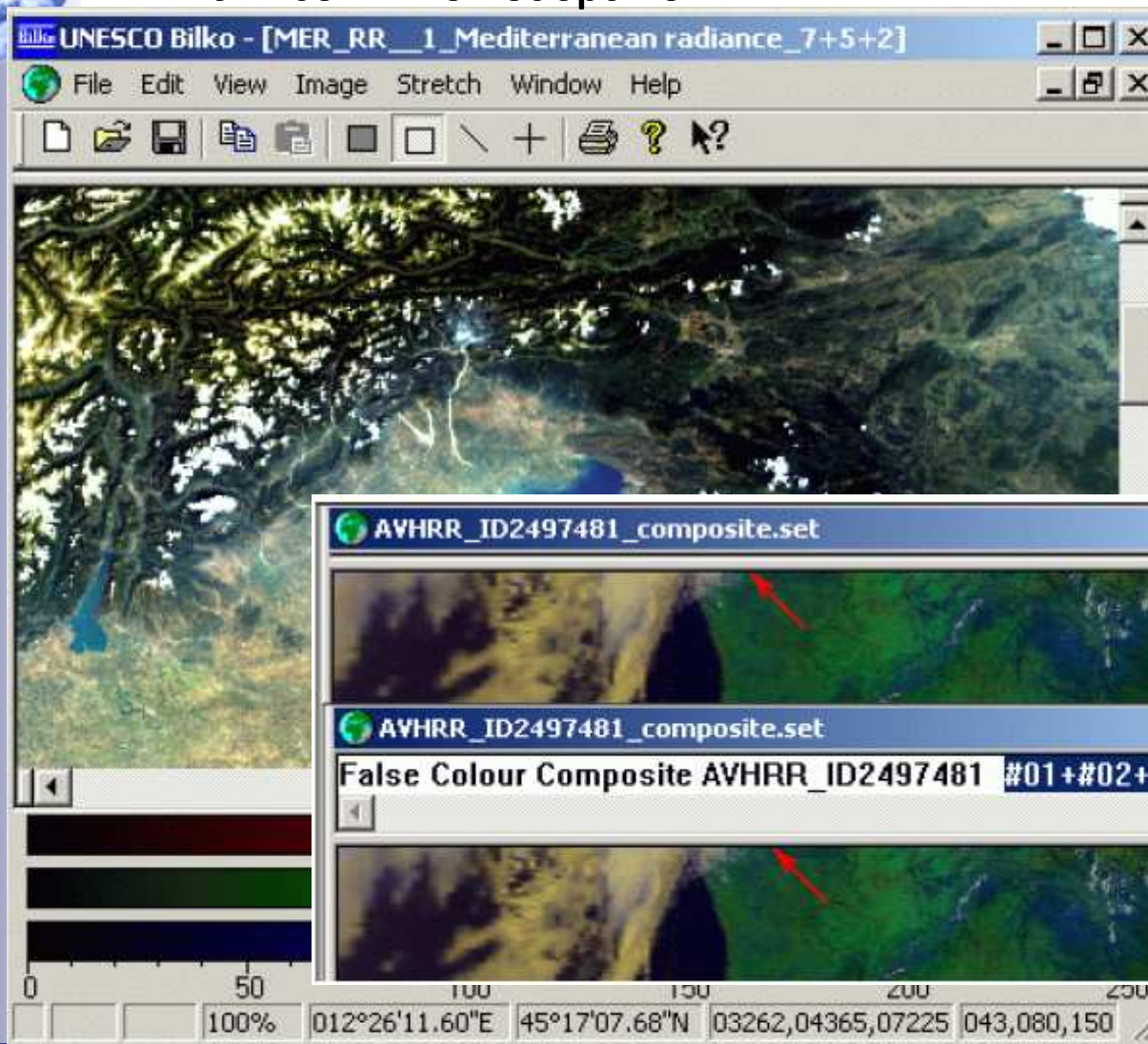


Использование БИЛКО на русском языке



Композитные изображения

Envisat/MERIS



NOAA/AVHRR



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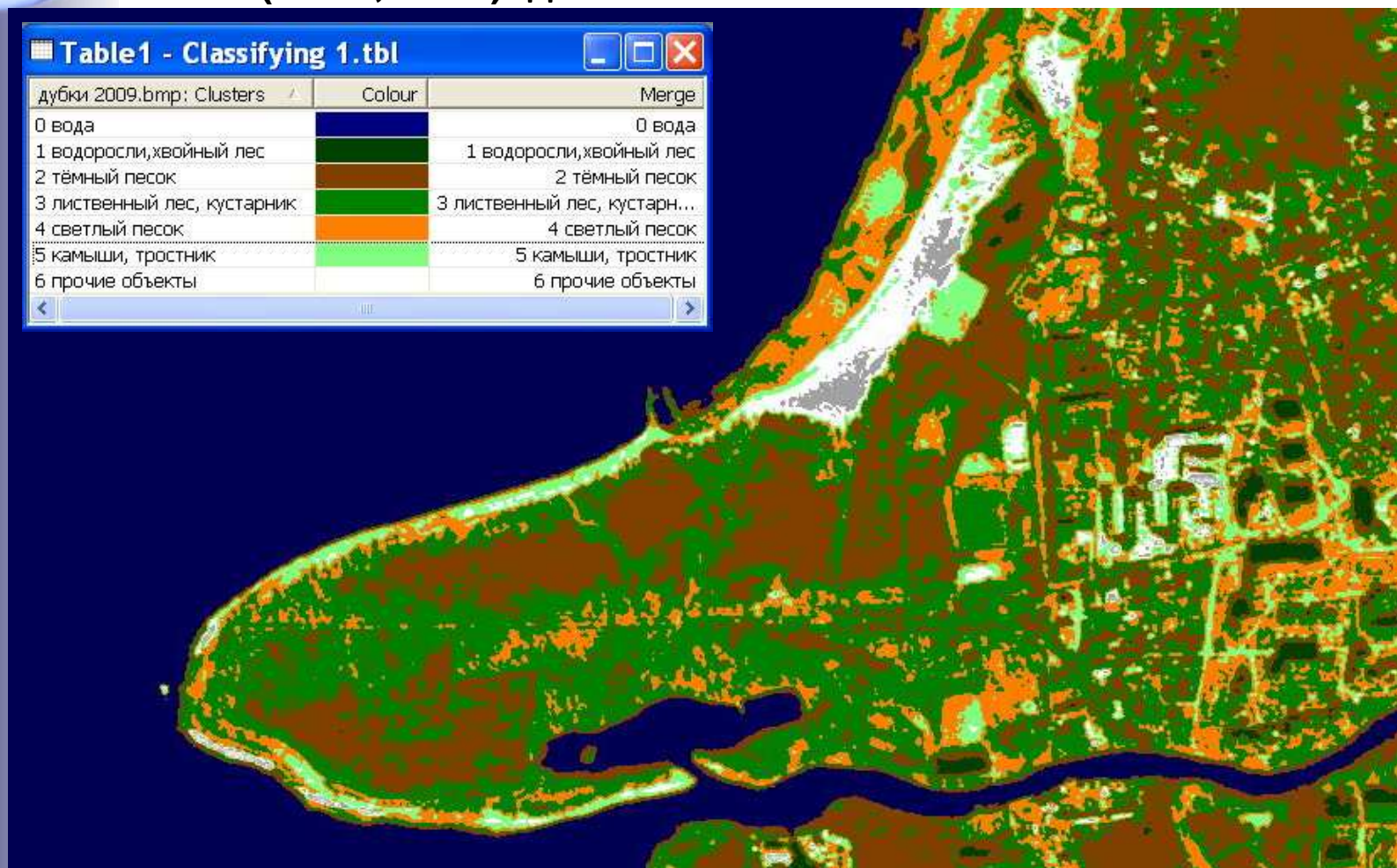




Использование БИЛКО на русском языке



Результаты классификации без обучения,
SPOT (июнь, 2008) для восточной части Финского залива



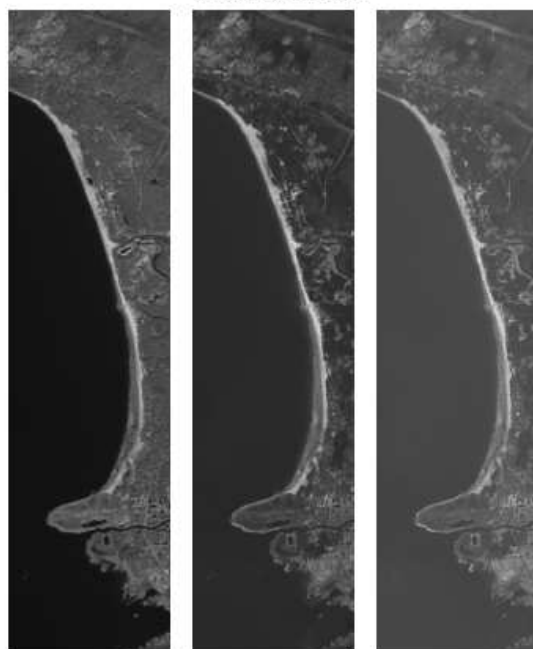


Использование БИЛКО на русском языке



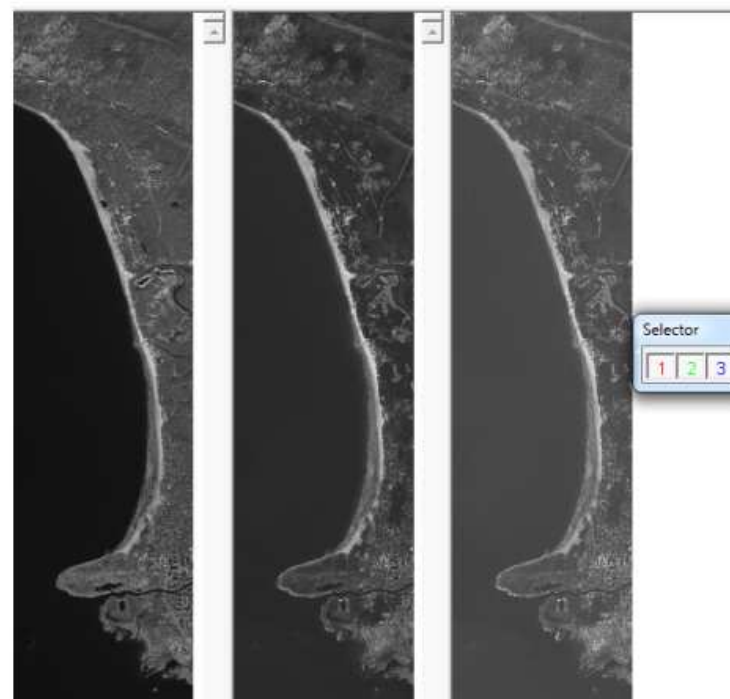
Результаты классификации без обучения,
SPOT (июнь, 2008) для восточной части Финского залива

SPOT-5 satellite image
3 channels



Dubki

Select of channel colour
(red, green, blue)



connection



Unsupervised classification





Использование БИЛКО на русском языке



Результаты классификации без обучения,
SPOT (июнь, 2008) для восточной части Финского залива

без обучения

с обучением

Ихора без обучения: Clusters			
	Colour	Merge	IMAGERY #01 From
0 глубокая вода		0 глубокая вода	17.8
1 мелководье		1 мелководье	37.9
2 илы, водоросли, высокие деревья		2 илы, водоросли, высокие деревья	68.7
3 кустарники		3 кустарники	20.1
4 трава, осока		4 трава, осока	43.6
5 мокрый песок		5 мокрый песок	71.7
6 песок с галькой		6 песок с галькой	61.8
7 крупнозернистый песок с мелкой галькой		7 крупнозернистый песок с мелкой галькой	49.4
8 крупнозернистый песок с мелкой галькой		8 крупнозернистый песок с мелкой галькой	75.5
9 осушенная часть побережья		9 осушенная часть побережья	78.6
10 сухой мелкозернистый песок		10 сухой мелкозернистый песок	58.2
11 песок с сухим тростником		11 песок с сухим тростником	83.5
12 сухой тростник		12 сухой тростник	87.6
13 здание		13 здание	74.9
14 здание		14 здание	97.2
15 здание		15 здание	98.6

Description: Stack	Upper Left	Size	Pixels	Class: Water landscape classes	Mean TD
<input checked="" type="checkbox"/> TS #000:	(1042, 0006)	(0042, 0050)	2100	Deep water	1401
<input checked="" type="checkbox"/> TS #001:	(0972, 0150)	(0039, 0030)	1402	Deep water	1309
<input checked="" type="checkbox"/> TS #002:	(0701, 0064)	(0040, 0039)	1560	Deep water	1366
<input checked="" type="checkbox"/> TS #003:	(0365, 0004)	(0022, 0011)	242	Deep water	1330
<input checked="" type="checkbox"/> TS #004:	(0015, 0102)	(0027, 0021)	567	Deep water	1261
<input checked="" type="checkbox"/> TS #005:	(0113, 0130)	(0015, 0015)	225	Deep water	1335
<input checked="" type="checkbox"/> TS #006:	(1125, 0006)	(0004, 0004)	16	Deep water	1709
<input checked="" type="checkbox"/> TS #007:	(0165, 0003)	(0010, 0007)	70	Deep water	1713
<input checked="" type="checkbox"/> TS #008:	(0013, 0297)	(0011, 0010)	110	Deep water	1797
<input checked="" type="checkbox"/> TS #009:	(0193, 0267)	(0007, 0007)	49	Deep water	1387
<input checked="" type="checkbox"/> TS #010:	(0245, 0196)	(0012, 0007)	84	Deep water	1335
<input checked="" type="checkbox"/> TS #011:	(0012, 0198)	(0016, 0010)	160	Deep water	1336
<input checked="" type="checkbox"/> TS #012:	(0261, 0309)	(0013, 0005)	65	Deep water	1778
<input checked="" type="checkbox"/> TS #013:	(0320, 0269)	(0009, 0008)	72	Deep water	1581
<input checked="" type="checkbox"/> TS #014:	(0251, 0270)	(0005, 0007)	35	Deep water	1625
<input checked="" type="checkbox"/> TS #015:	(0211, 0209)	(0010, 0008)	80	Deep water	1245
<input checked="" type="checkbox"/> TS #016:	(0260, 0230)	(0007, 0008)	56	Deep water	1526
<input checked="" type="checkbox"/> TS #017:	(0447, 0159)	(0009, 0007)	63	Deep water	1637
<input checked="" type="checkbox"/> TS #018:	(0530, 0085)	(0005, 0006)	650	Deep water	1269
<input checked="" type="checkbox"/> TS #019:	(0481, 0207)	(0007, 0008)	56	Deep water	1572
<input checked="" type="checkbox"/> TS #020:	(0526, 0272)	(0010, 0008)	80	Deep water	1327
<input checked="" type="checkbox"/> TS #021:	(0683, 0261)	(0017, 0012)	204	Deep water	1277
<input checked="" type="checkbox"/> TS #022:	(0656, 0327)	(0011, 0010)	110	Deep water	1357

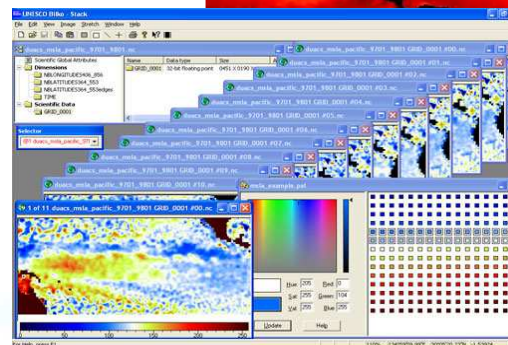
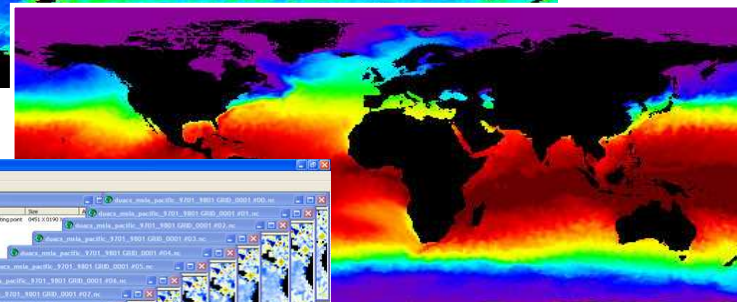
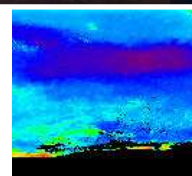
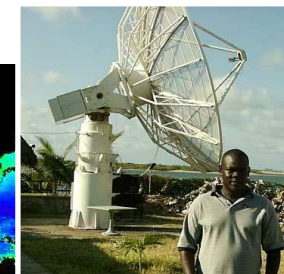
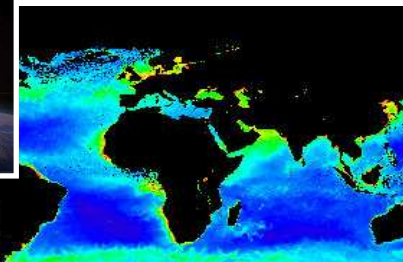




Content



- What is Bilko?
- A brief history
- Bilko today:
 - ❖ Software
 - ❖ Tutorials and lessons
 - ❖ Web site
- Bilko Users
- Challenges
- Conclusions





What is Bilko?



What is Bilko?

A brief history

Bilko today:

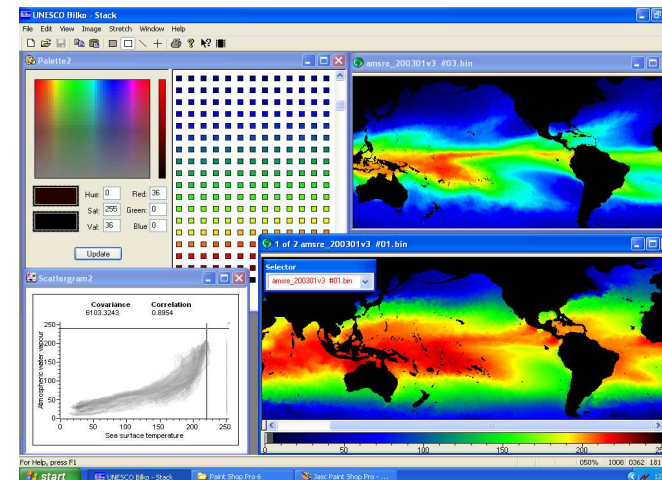
- Software
- Tutorials and lessons
- Web site

Bilko users

Challenges

Conclusions

- A unique marine and coastal remote sensing **distance-learning project** based on use of personal computers
- AIM: **develop capacity in coastal and marine remote sensing** through a series of computer-based learning modules using a specially commissioned educational image-processing software package (Bilko).





Emphasis on practical work



What is Bilko?

A brief history

Bilko today:

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Bilko users

Challenges

Conclusions

➤ Hands-on approach to training in coastal and marine remote sensing - especially for those traditionally excluded from RS training by the:

- ❖ **high cost** of commercial image-processing software, and the need for expensive computers to run that software,
- ❖ **difficulty of acquiring remotely sensed images** for teaching,
- ❖ **long learning-curves** required to master complex software,
- ❖ need to teach **large numbers of students** at the same time.





More than just software ..



What is Bilko?

A brief history

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Conclusions

➤ Objectives:

- ❖ Provide educational image processing **software** capable of operating on low-cost computers
- ❖ Produce **tutorials** to support the software and teach image processing and analysis skills
- ❖ Develop lessons in a wide **range of applications**
 - Examples from different regions and disciplines
 - Essential background information to facilitate interpretation
- ❖ Create and foster a **community** of Bilko users
 - Distribute all material **FREE** of charge via Bilko website
 - Offer assistance with workshops and courses
 - Encourage users to share resources and develop new material





Organisational structure



What is Bilko?

A brief history

Bilko today:

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Bilko users

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➤ Expert advisory group

❖ International **Bilko Executive Steering Team**

- Remote sensing experts from around the world
- Develop strategy & set priorities
- Review, edit and test new lessons

➤ Software developer and lesson authors

❖ Volunteer effort by core team of experts

➤ Project Office

- ❖ Website and day-to-day user support
- ❖ Advice to organisers of courses and workshops

➤ All done by **volunteers**





A brief history



What is Bilko?

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➤ Started in 1987 by UNESCO – 25 years

- ❖ Part of the Marine Sciences Training and Education Program (TREDMAR).

➤ 1987-2003

- ❖ Part of the Coastal and Small Islands (CSI) initiative
 - Project office at the Faculty of Geo-Information Science and Earth Observation (ITC), NL
 - Website at University of Newcastle-upon-Tyne, UK
 - 1900+ users in 500+ organisations in 60+ countries

➤ 2003-present

- ❖ Part of IOC/WMO JCOMM strategy for remote sensing
 - Project office and website at National Oceanography Centre, Southampton, UK from 2004.
 - 5200+ users in 1300+ organisations in 168 countries

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The early years



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➤ Bilko for DOS

- ❖ 5 teaching modules over 7 years

➤ Winbilko (1995-2002)

- ❖ Software developed for new Windows 3.1 platform
 - Bilko 1.0 => Bilko 1.2
- ❖ Interactive help file and new tutorial running side by side with the software in a separate window
- ❖ More interactive and user friendly lessons
- ❖ New applications modules
 - Coastal and marine applications of remote sensing (6)
 - Applications to Tropical Coastal Management (7)
 - Almost completed Fisheries Module (8)





Extensive updates 2004-2006



What is Bilko?

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- Supported by IOC and ESA
- Software upgrade to Bilko v3
 - ❖ Support for common image data formats
 - ❖ Display, processing and analysis tools similar to those found in commercial software
 - ❖ Designed to promote understanding, **no black boxes**
- New / updated tutorials and lessons
 - ❖ Introduction to Bilko v.3
 - ❖ 7: Coastal management revised and extended
 - ❖ 8: Fisheries applications revised and completed
 - ❖ Envisat module.
- New website

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The software today



What is Bilko?

A brief history

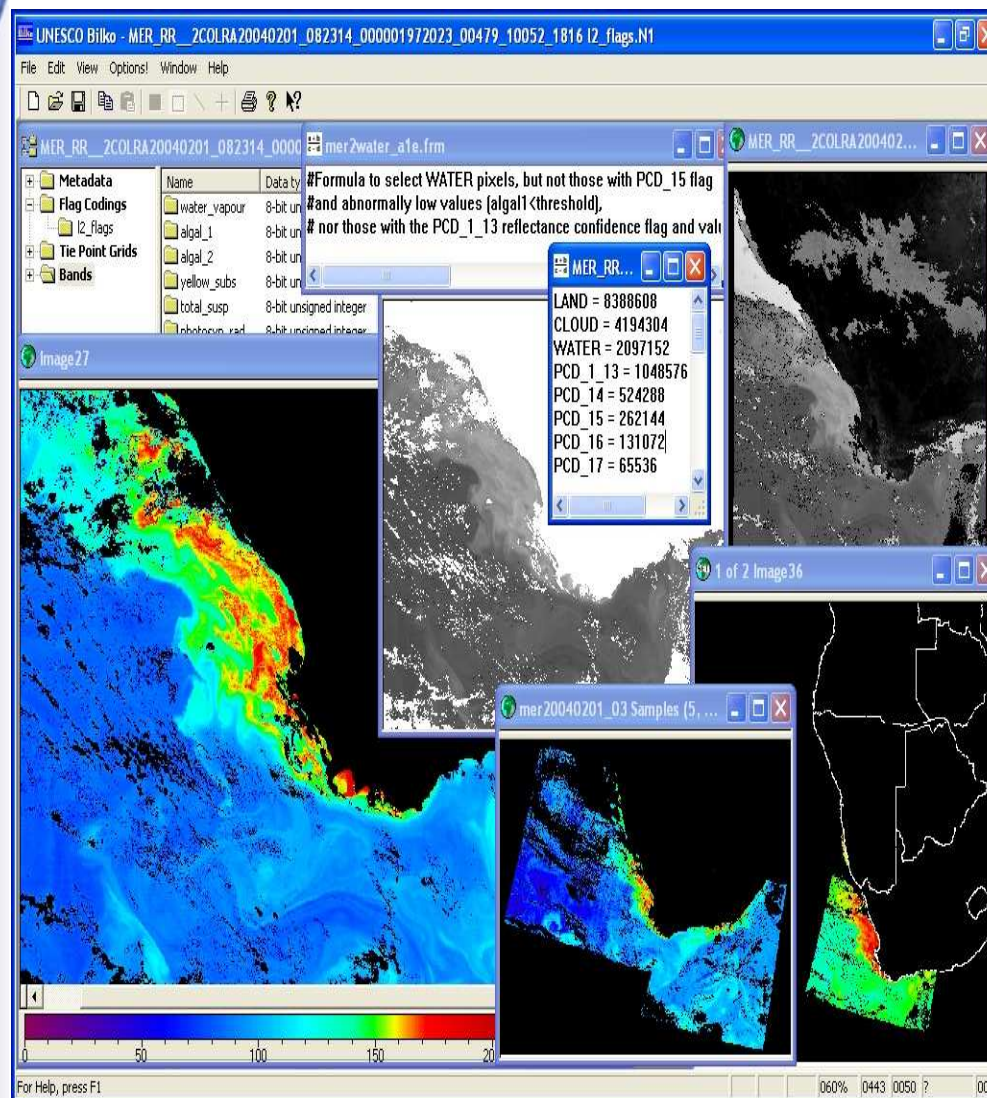
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❖ Input formats

- HDF (3D)
- NetCDF (3D)
- Envisat N1
- GeoTIFF
- USGS Mapgen
- Binary flat-files
 - 8, 16, 32-bit

❖ Output

- Binary (8,16,32 bit)
- Geo-TIFF
- GIF (8-bit paletted)
- BMP
 - 8-bit grey, 24-bit RGB





Colour composites



What is Bilko?

A brief history

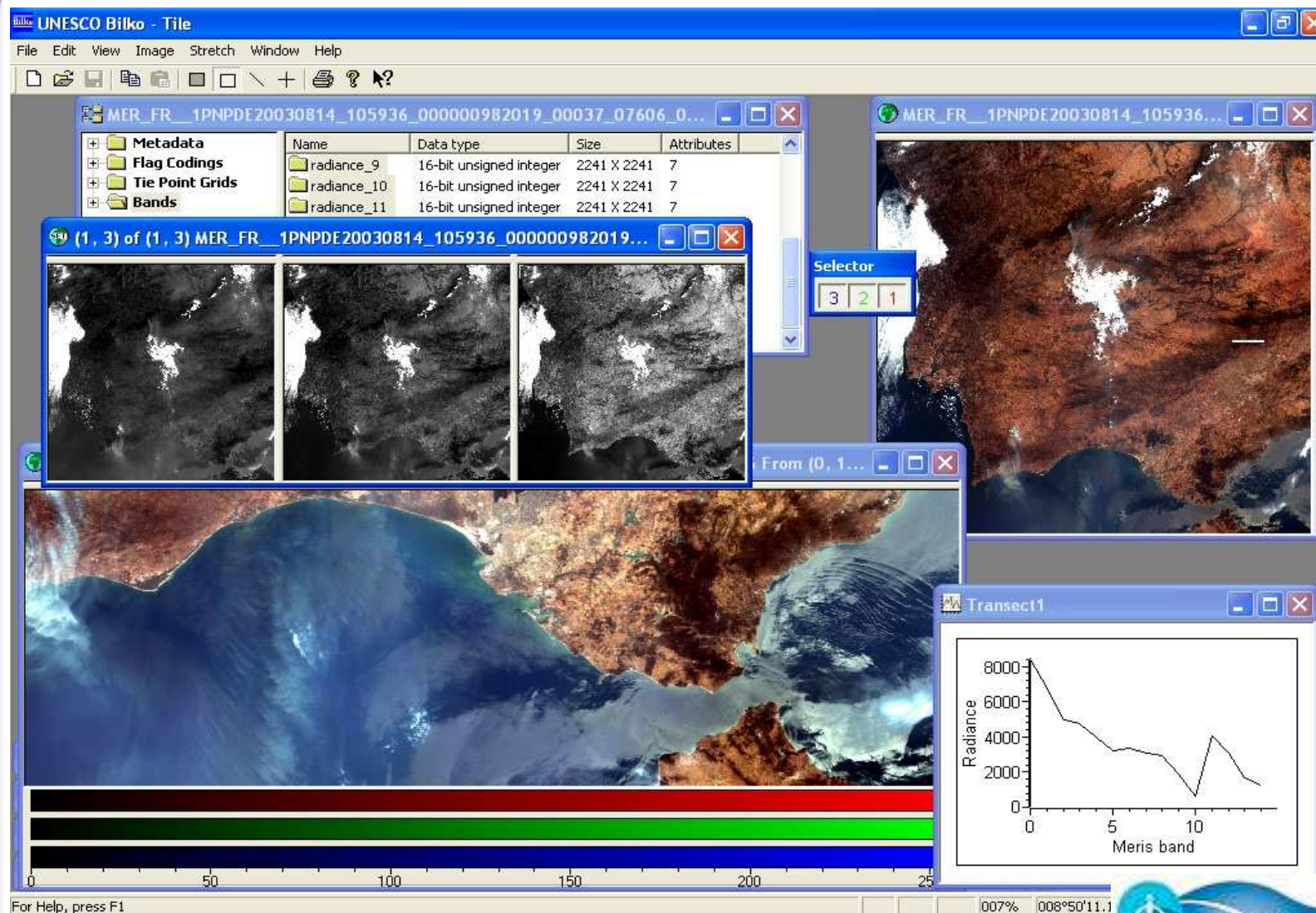
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Contrast stretching



What is Bilko?

A brief history

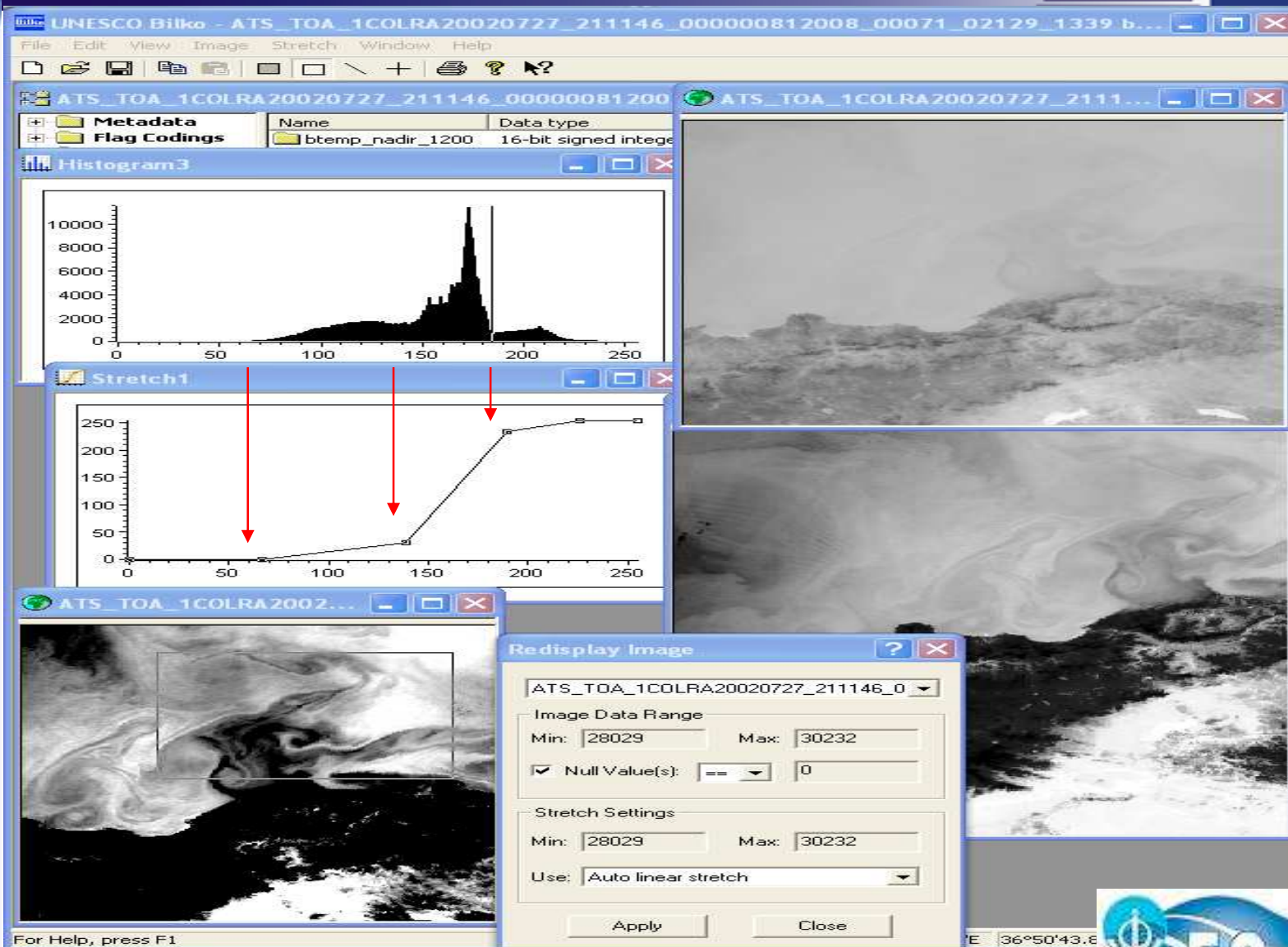
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Palette tool



What is Bilko?

A brief history

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-Software

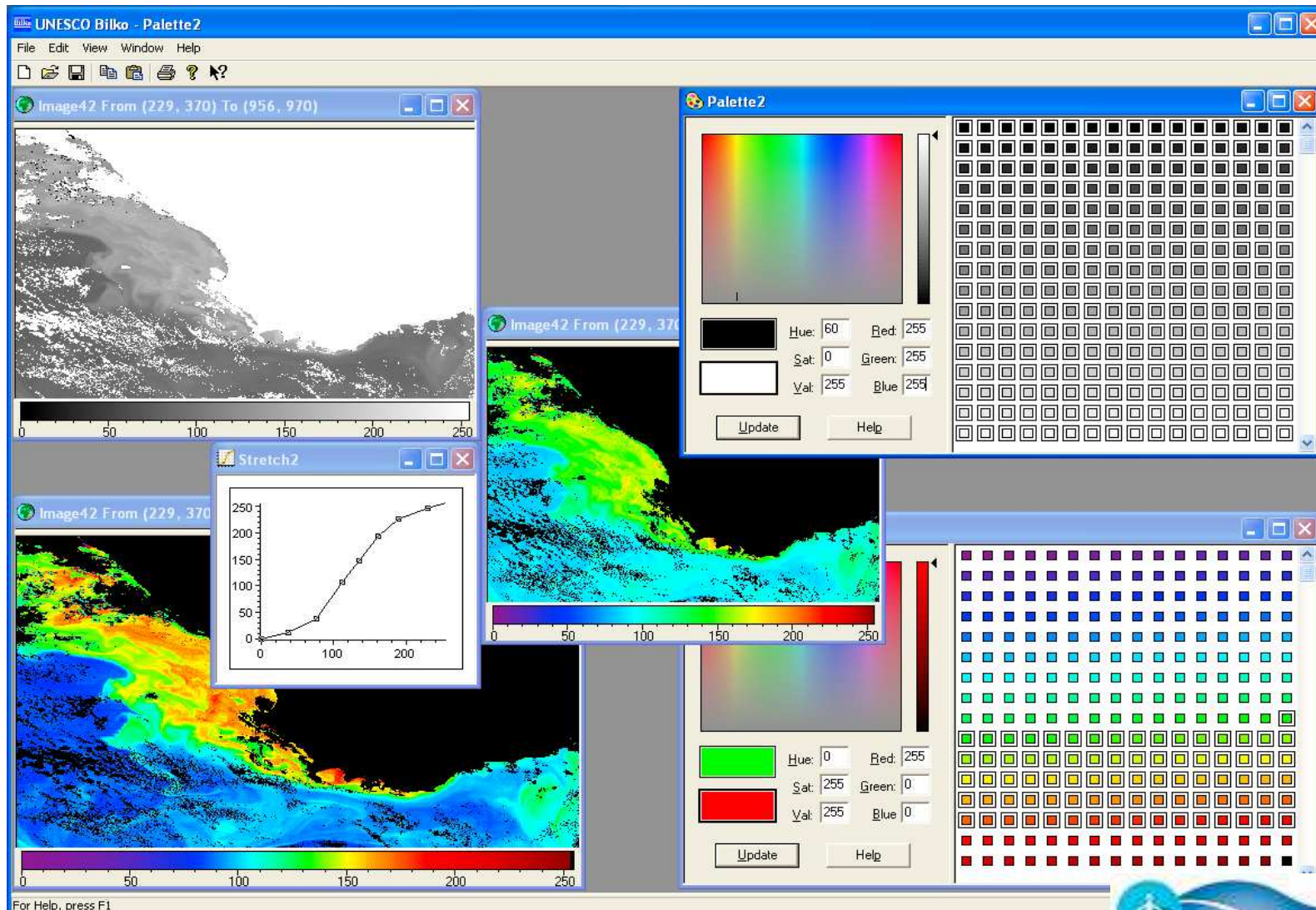
-Tutorials and lessons

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Spatial filters



What is Bilko?

A brief history

Bilko today:

-Software

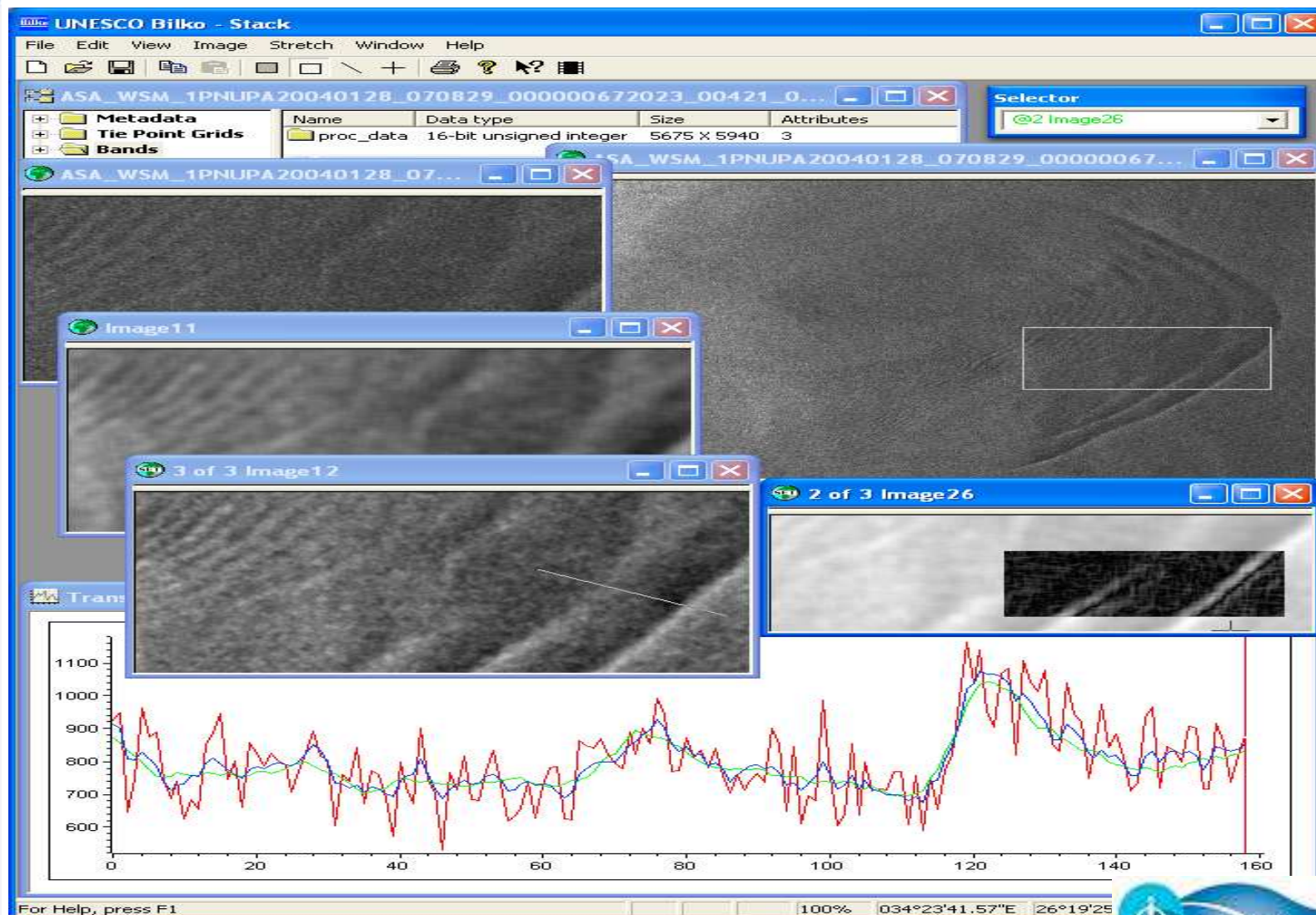
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3D: time series or spectra



What is Bilko?

A brief history

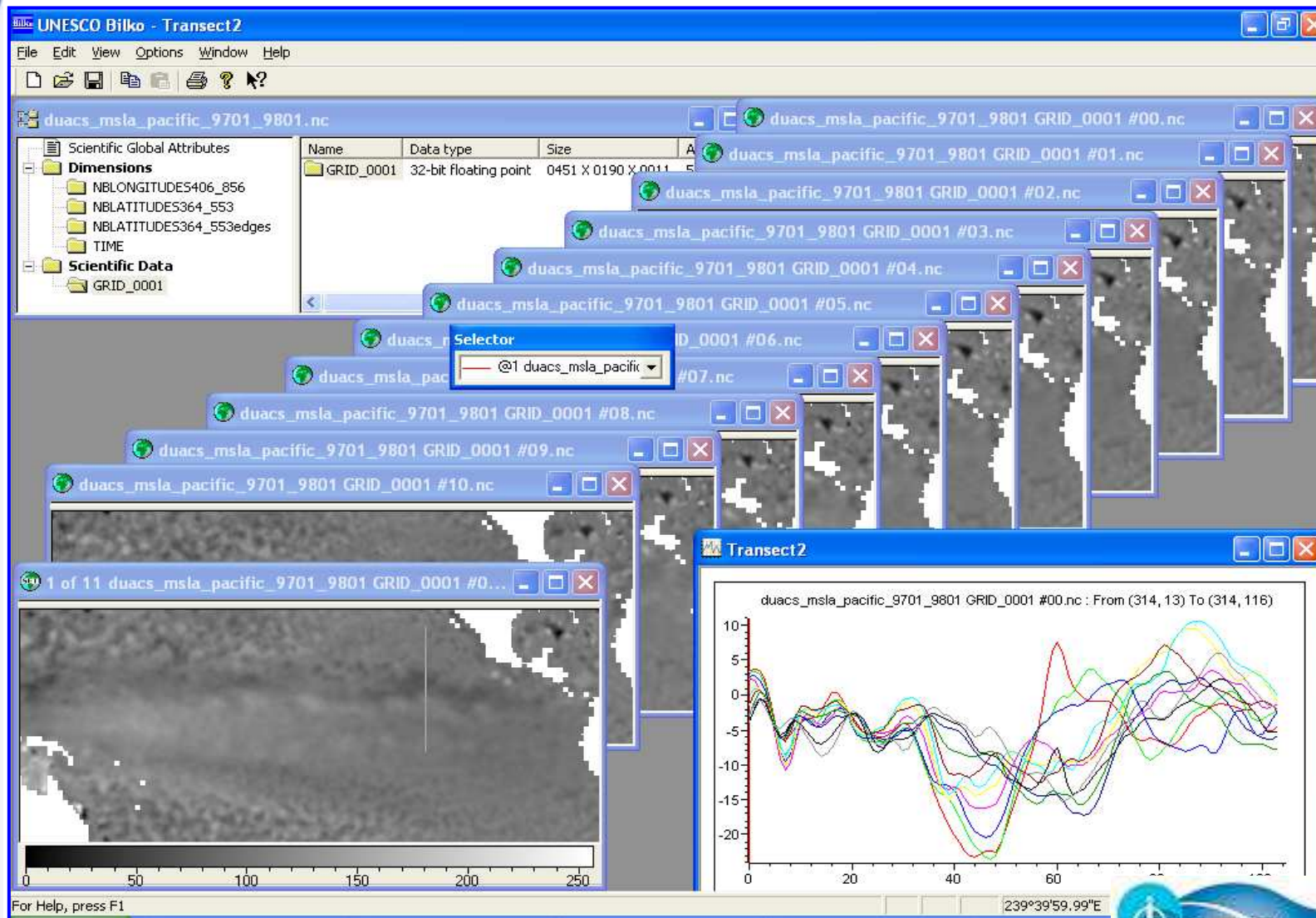
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Hovmöller diagrams



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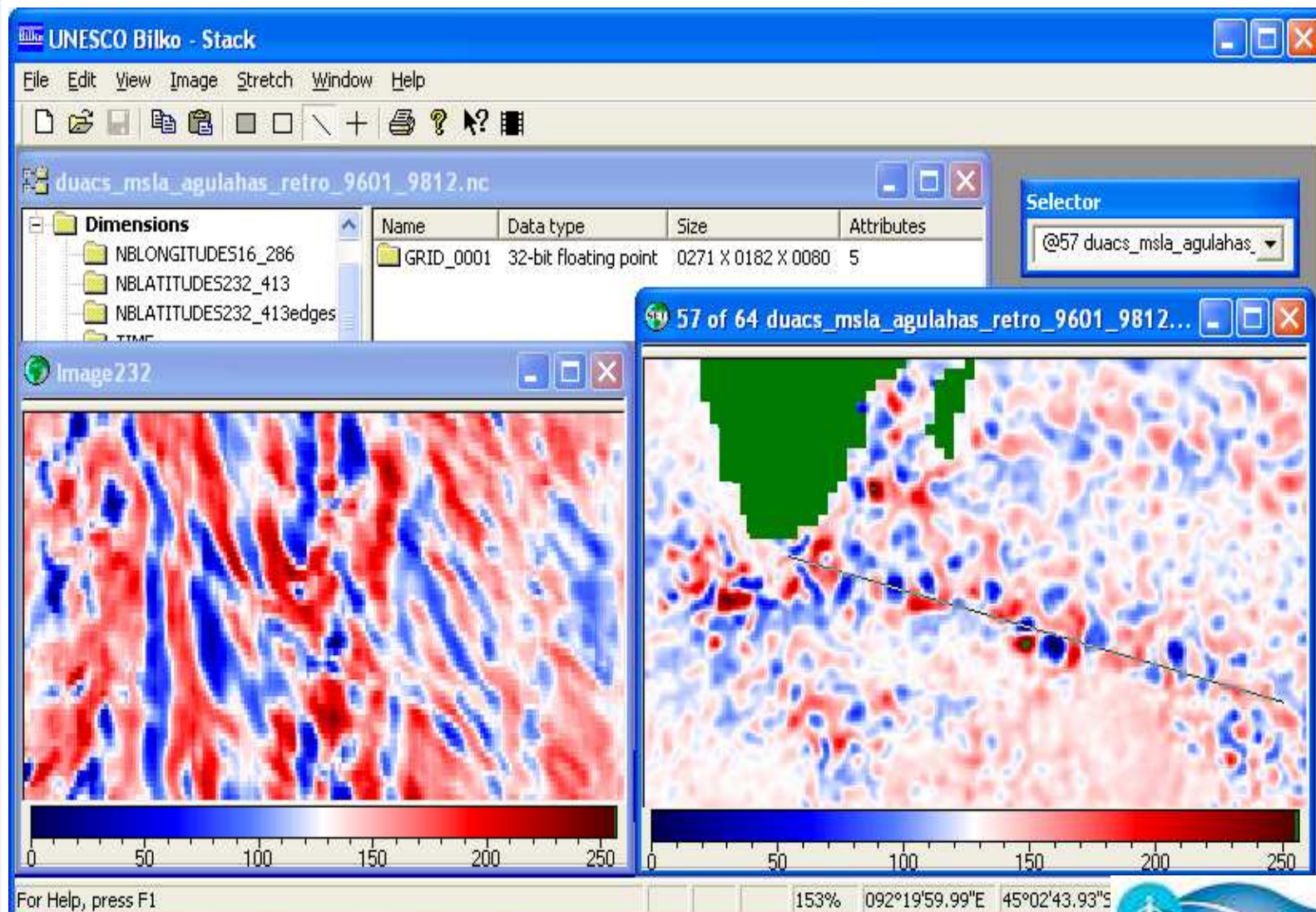
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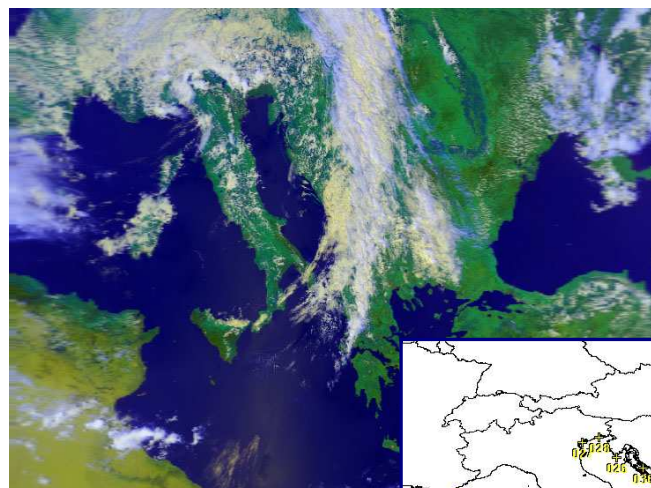
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St Petersburg, 27 – 30 April 2010

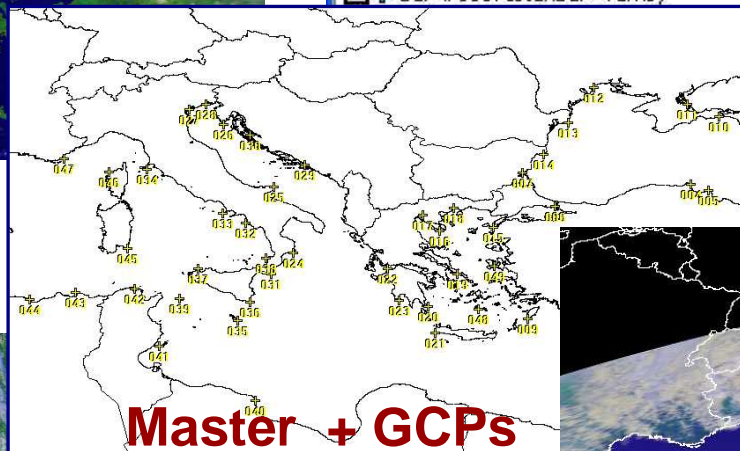
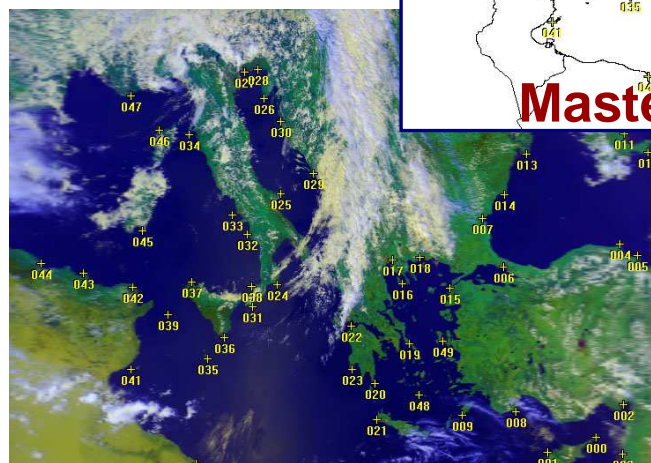




Geometric correction



Uncorrected
Slave + GCPs



Master + GCPs

Mediterranean.tbl - Linear			
Description	Master: Mediterranean_coastli...	Slave: AVHRR_I...	RMS:
<input checked="" type="checkbox"/> +GCP #000: NE Cyprus - Cape Andreas	(034°36'23.91"E, 35°42'10.68"N)	(0673, 0516)	17.93
<input checked="" type="checkbox"/> +GCP #001: W Cyprus - Cape Arnauti	(032°16'39.62"E, 35°05'28.04"N)	(0618, 0533)	15.08
<input checked="" type="checkbox"/> +GCP #002: Dortyo - Turkey	(035°46'51.58"E, 36°45'32.03"N)	(0704, 0479)	20.74
<input checked="" type="checkbox"/> +GCP #003: Tarabulus - Lebanon	(035°49'13.68"E, 34°27'34.33"N)	(0703, 0535)	42.91
<input checked="" type="checkbox"/> +GCP #004: Sinop - Turkey	(035°08'57.87"E, 42°01'43.27"N)	(0700, 0297)	15.82
<input checked="" type="checkbox"/> +GCP #005: Bafra Burnu - Turkey	(035°58'06.59"E, 41°43'21.95"N)	(0720, 0310)	15.81
<input checked="" type="checkbox"/> +GCP #006: Istanbul - Turkey	(028°59'29.24"E, 41°00'44.03"N)	(0568, 0323)	6.23
	(027°28'53.67"E, 42°32'30.65"N)	(0544, 0268)	9.44
	(023°44'24.60"E, 39°54'10.22"N)	(0453, 0342)	11.42

Rectification table

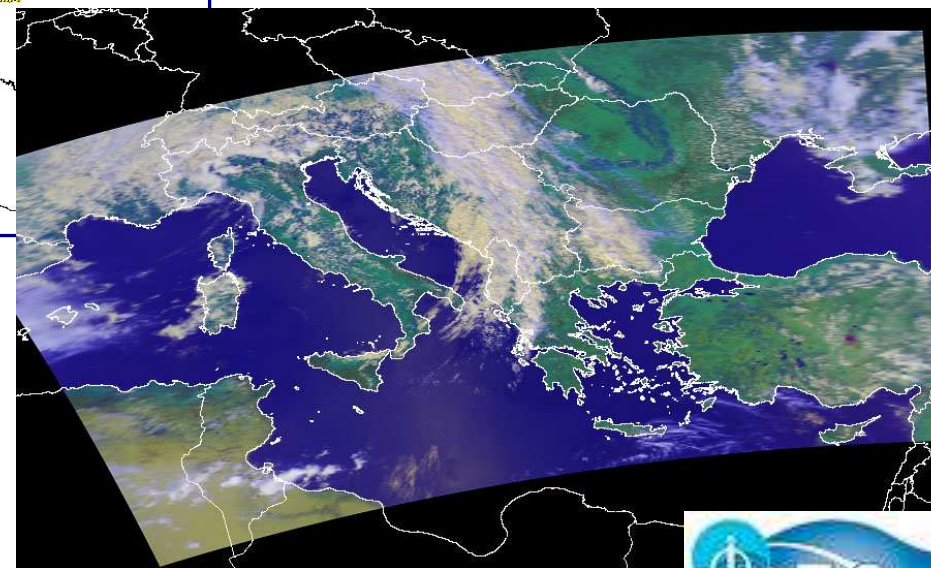




Image arithmetic

What is Bilko?

A brief history

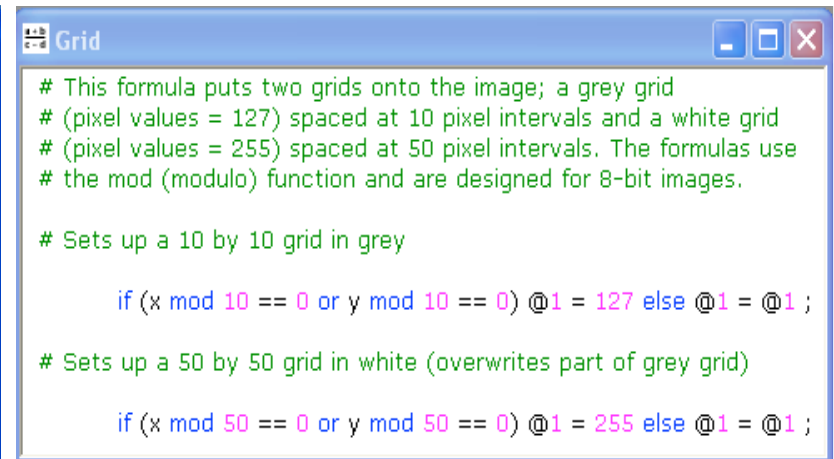
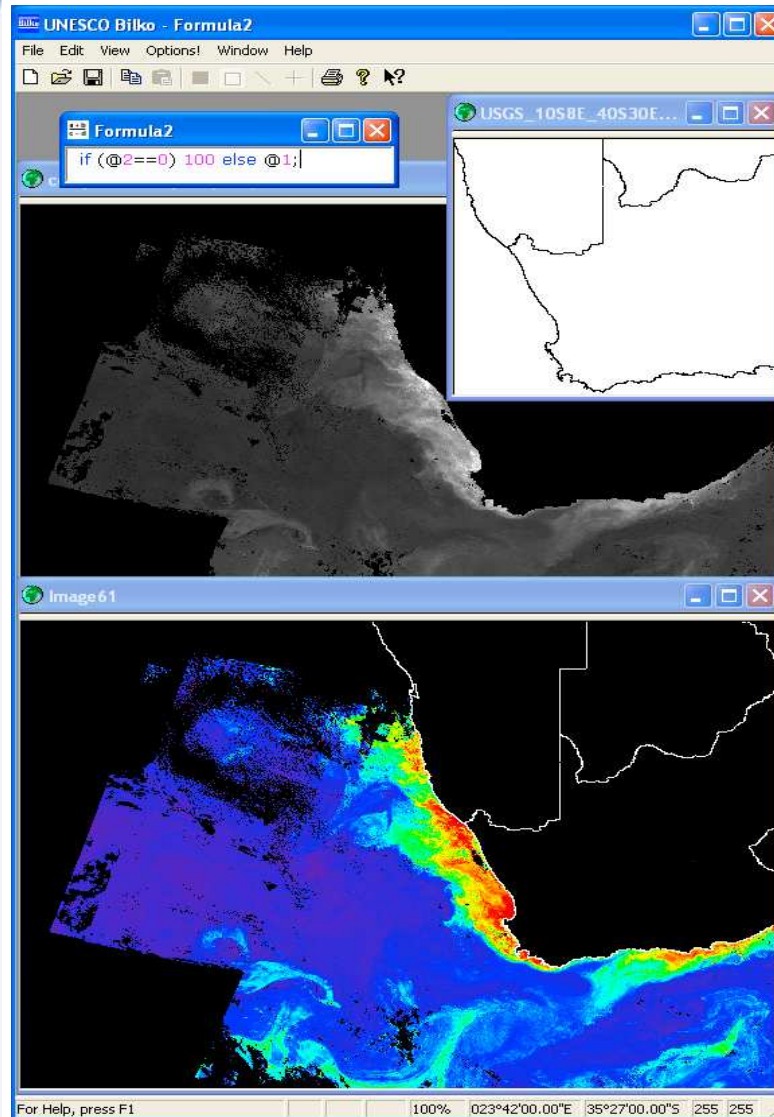
Bilko today:

- Software
- Tutorials and lessons
- Web site

Bilko users

Challenges

Conclusions



❖ Many different uses:

- Calculate geophysical parameter values
- Flags, grids, borders
- Band ratio algorithms
- Image mosaics
- Simple GIS
- Loops for repeat processing



Principal Component Analysis



What is Bilko?

A brief history

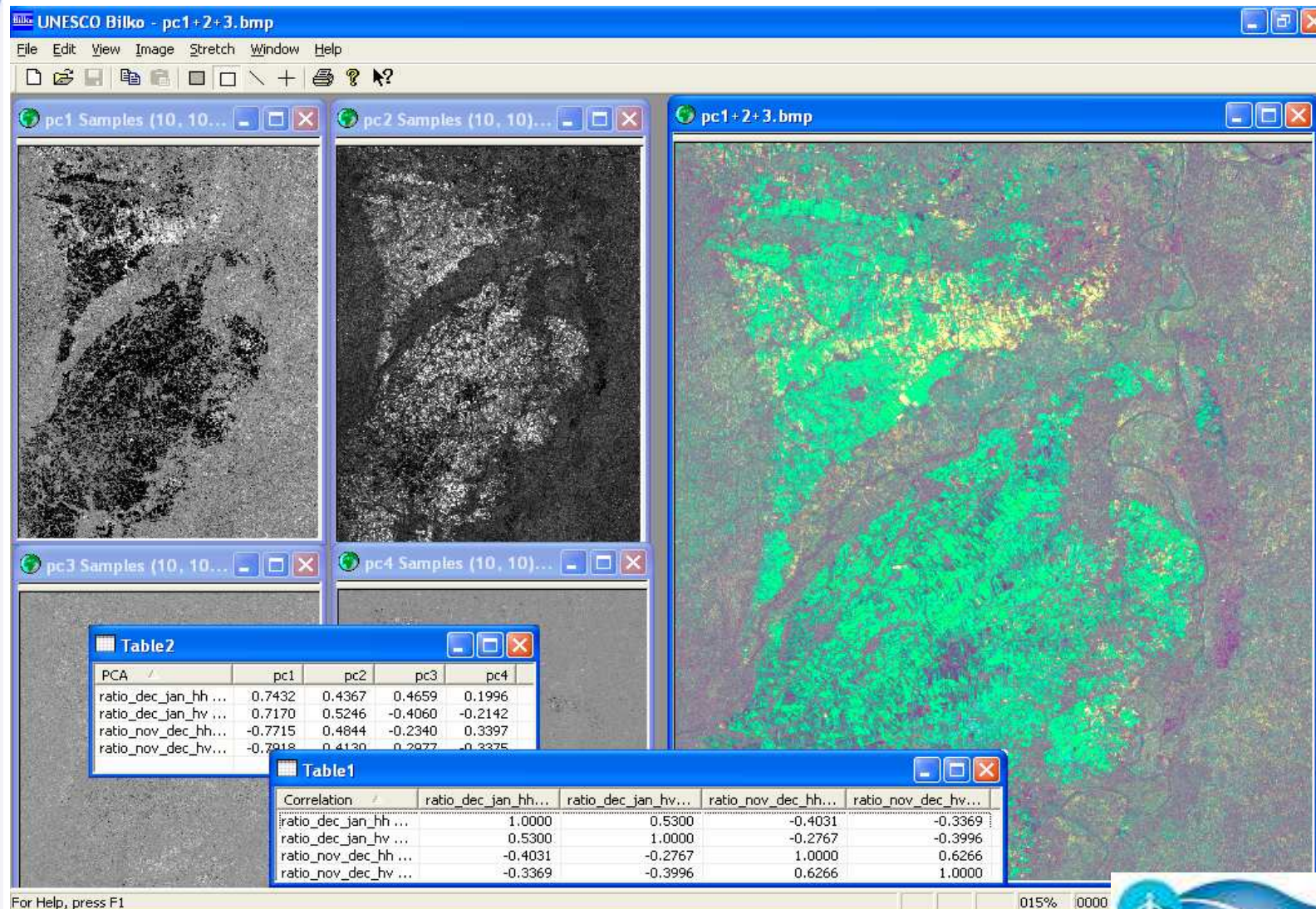
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- Tutorials and lessons
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Bilko users

Challenges

Conclusions



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Classification



What is Bilko?

A brief history

Bilko today:

- Software
- Tutorials and lessons
- Web site

Bilko users

Challenges

Conclusions

UNESCO Bilko - Table1 - Classifying

File Edit View Accuracy Window Help

Herts supervised classification training sites.tbl

Description	Upper Left	Size	Pl...	Class
<input checked="" type="checkbox"/> TS #033: A a7 parkland: grass, scattered t...	(506088.0E, 0217052.0N)	(0008, 0008)	64	
<input checked="" type="checkbox"/> TS #034: B Luton Hoo Home Farm	(510140.0E, 0217776.0N)	(0006, 0004)	24	

5 of 6 Ikonos_Herts#04+#02+#01 - Training

Herts landuse classes.tbl

Description	Label	Colour
Class #003: Mixed woodland - RRes 3	Mixed wood	
Class #004: Scrub - RRes 4+5	Scrub	
Class #005: Grass and verge: heavily managed - RRes 6a	Grass a	
Class #006: Grass and verge: frequently managed - RRes 6b	Grass b	
Class #007: Grass and verge: frequent to infrequently managed...	Grass c	
Class #008: Grass and verge: infrequently managed - RRes 6d	Grass d	
Class #009: Grass and verge: v. infrequent - no management - ...	Grass e	
Class #010: Marshy grassland with standing water - RRes 6f	Grass f	
Class #011: Tall ruderal - wasteland vegetation - RRes7	Wasteland	
Class #012: Water, standing or running - RRes 8	Water	
Class #013: Spring sown crops - ploughed fields, bare soil - RRes 9	Bare soil	
Class #014: Arable set aside - RRes 10	Set aside	

Image17 - Classifying

Table1 - Classifying

Image17: Classes	Colour	Merge	Ikonos_Herts#01.dat	Ikonos_Herts#02.dat	Ikonos_Herts#03.dat	Iko
Wheat		Wheat	284, 299.05988, 313	270, 296.48894, 322	159, 184.68828, 210	739,
Barley		Barley	301, 328.81527, 355	321, 389.44596, 457	200, 272.1762, 344	776,
Oats		Oats	286, 294.15011, 301	294, 305.43897, 316	172, 182.12737, 191	964,
Beans		Beans	320, 332.13948, 344	338, 357.35714, 375		

Water

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More than just software...



What is Bilko?

A brief history

Bilko today:

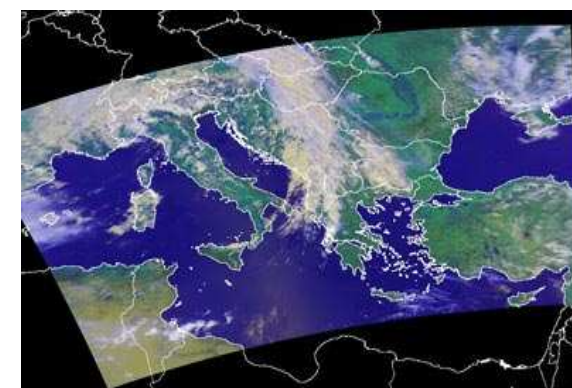
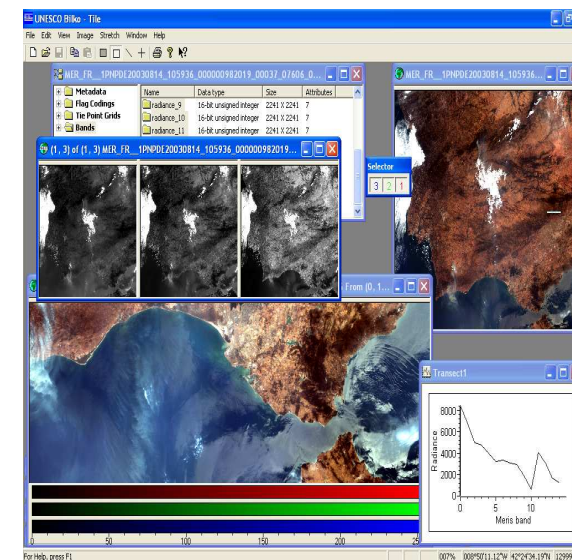
- Software
- Tutorials and lessons
- Web site

Bilko users

Challenges

Conclusions

- A complete training system
 - ❖ for teaching and learning RS
- Tutorials supporting software
 - ❖ Introduction to Bilko
 - Hands-on experience with **basic** image processing techniques
 - Background information
 - ❖ Mini-lessons
 - Demonstrate **advanced** processing & analysis techniques
- Modules / single lessons on coastal and marine applications of RS





Example lesson structure



What is Bilko?

A brief history

Bilko today:

-Software

-Tutorials and lessons

-Web site

Bilko users

Challenges

Conclusions

➤ Introduction

- ❖ Aim and objectives
- ❖ Images used
- ❖ Content overview

ATS_TOA_1COLRA20020727_~.N1

The AATSR data set used in this lesson are stored in an ESA ENVISAT N1 data format generically called ATS_TOA_1P files. This is a custom data format developed specifically for the ENVISAT mission and is self describing. This Bilko for Windows lesson is based on an ENVISAT N1 gridded Brightness Temperature and Reflectance (GBTR) data set and includes geo-referenced 1km nadir and forward view image data sets together with additional metadata and supporting information. The GBTR N1 data product contains the following generic components:

- **Metadata:** An ASCII format metadata record describing the image data file and its contents.
- **Flag Codings:** a description of the bitfield flag coding used in the confidence (confide_flags_nadir and confide_flags_fward) and cloud flag (cloud_flags_nadir and cloud_flags_fward) bitfields associated with each nadir and forward view pixel,
- **Tie Points Grids:** contains gridded geolocation information (equi-spaced every 25km along- and across-track), ENVISAT orbit parameters and sun/satellite viewing geometry
- **Bands:** contains the full resolution 1km remapped geolocated individual nadir and forward view brightness temperature and reflectance data.

For a full description of AATSR data, see ESA's AATSR user handbook at <http://envisat.esa.int/dataproducts/aatsr/>

Observing the Ocean from Envisat

Module content | Tutorial content | Lesson Images | References | Credits | Authors

3. Sea surface temperature from AATSR

Aim and objectives | Section content | Images used in this section

Aim and objectives

This lesson introduces you to the ENVISAT Advanced Along-Track scanning Radiometer (AATSR), and shows data from this instrument can be used to map fine scale sea surface temperature patterns in the western Mediterranean Sea. At the end of the lesson you should be able to:

- Understand the unique measurement capability and main features of the ENVISAT AATSR instrument.
- Identify the main features of the AATSR ATS_TOA_1P Gridded Brightness Temperature and Reflectance (GBTR) data product.
- Characterise the general sea surface temperature (SST) patterns in the Western Mediterranean Sea using AATSR data.
- Understand the basic principles of cloud flagging using AATSR data at night
- Understand multi-spectral and multi-view atmospheric correction techniques and the difference between brightness temperature image data sets and sea surface temperature maps
- Measure and describe meso-scale and fine scale thermal features of the Balearic Basin, Gulf of Lions and Algerian Basin of the Mediterranean Sea.

Try to refer back to these objectives as you work through this lesson. The lesson should take you about 2 -3 hours to complete.

Lesson content

- Becoming familiar with AATSR GBTR data opening and examining ATS_TOA_1*.N1 file structure, and loading individual images.
- Surface wind in the study area investigating surface wind fields using Met Office model output
- Masking cloud and land pixels using L1 flags to create masks and assigning Null values to masked pixels
- Look-angle differences in brightness temperature investigating differences between the forward and nadir view data sets
- 6-channel SST retrieval computing sea surface skin temperature from 6 AATSR GBTR channels.
- Summary and conclusions

Images used in this lesson

- ATS_TOA_1COLRA20020727_~.N1 Two level 1 images from the Mediterranean between Algeria and Spain showing top of atmosphere (TOA) brightness temperature measured by the AATSR sensor onboard ESA's Envisat satellite on July 27th, 2002.
- cdWE020727wind_*.dat Two images giving the wind field in the study area on July 27th, 2002. The images are part of the output of the UK Met Office European wave model. One image represents the wind speed in m s⁻¹; the other wind direction given in degrees (0-360°) where 0° represents winds from the North, 90° represents wind from the East, 180° wind from the South and 270° winds from the West.

Next: AATSR Level 1 data structure

eesa | Met Office





Example lesson structure

What is Bilko?

A brief history

Bilko today:

- Software
- Tutorials and lessons
- Web site

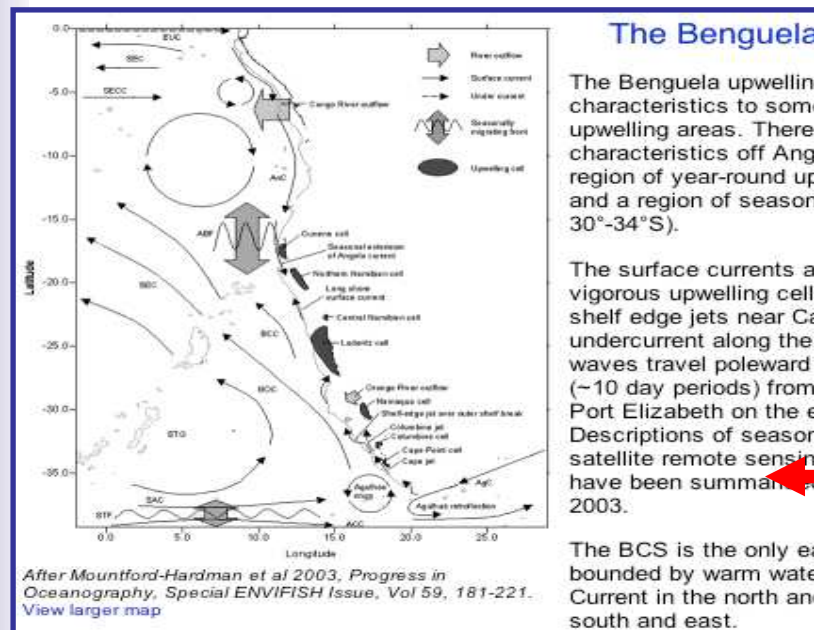
Bilko users


Challenges

Conclusions

- Introduction
 - ❖ Aim and objectives
 - ❖ Images used
 - ❖ Content overview

➤ Background information





Observing the Ocean from Envisat

[Module content](#)
[Tutorial content](#)
[Lesson Images](#)
[Referen](#)

5.2 Dealing with cloud in

[Using MERIS class flags](#)
[Using confident](#)

LESSON 5

Overview

[down](#)

References:
List of journal references

Downloads:

Images and tools

Lesson (HTML pages)

Images:

MER_RR_2COLRA200402-.N1 Description

Useful information:

The Benguela Current System

The MERIS product grid.

MERIS level 2 flags

Atmospheric correction of MERIS (and other optical algorithm that identifies pixels containing cloud. This identifies cloudy pixels based on their brightness, a may be used during the L2 processing in order to m

Whilst it is easy to identify pixels that are fully clou represents more of a problem. Edges of clouds, sca fog may be harder to identify, and L2 data sometim not been identified by the cloud-flagging algorithm. algorithms that rely on spectral ratios to calculate c section you will look at this problem in MERIS L2 d and investigate ways of overcoming the problem of flagged by the cloud-flagging routine.

Activity:

1. Open the file **MER_RR_2COLRA20040201_-.N1**.
2. In the left frame, select **Bands** and open the double-clicking on it in the right frame.
3. When the Redisplay dialogue appears, accep the null values.

As you can see, the image contains not just water concentrations; there are also cloud pixels showing pixels with the top of atmosphere vegetation index where no radiance samples were available to fill the

Using MERIS class flags

To produce a gridded imag scenes must contain only





Example lesson structure



What is Bilko?

A brief history

Bilko today:

-Software

-Tutorials and lessons

-Web site

Bilko users

Challenges

Conclusions

- Introduction
 - ❖ Aim and objectives
 - ❖ Images used
 - ❖ Content overview
- Background information
- Step-by-step instructions
- Questions to test student understanding

Question / Activity 4

Use the map in figure 6 as a guide to its content. You will find it easier to display using the Bilko manual software.

1. Open the **Stretch** menu and select **Stretch**.
2. In the Stretch window, double-click on the **Anchor** point.
3. Drag the anchor point down along the x-axis, for example to 1000 (000) display values on the x-axis.
4. Double-click to add a second anchor point at the top of the frame.

This maps all original display values of 210 or more to white, allowing you to clearly reveal eddies, river plumes and different temperatures. Use the new features in the two scenes. (You will find they are GIF files called **fig6.gif**, **fig7.gif** and **fig8.gif**).

Answers:
(Resizable pop-ups)

Answer 1

Answer 2

Answer 3

Answer 4:

Back up to:
Q1 Q2 Q3

Navigation: < up >

eesa

a) Locate the Balearic Islands on the Algerian coastline.

b) Can you see any cloudy areas?

c) Is there any evidence of coastal erosion?

Next: The sun





Lesson structure



What is Bilko?

A brief history

Bilko today:

-Software

-Tutorials and lessons

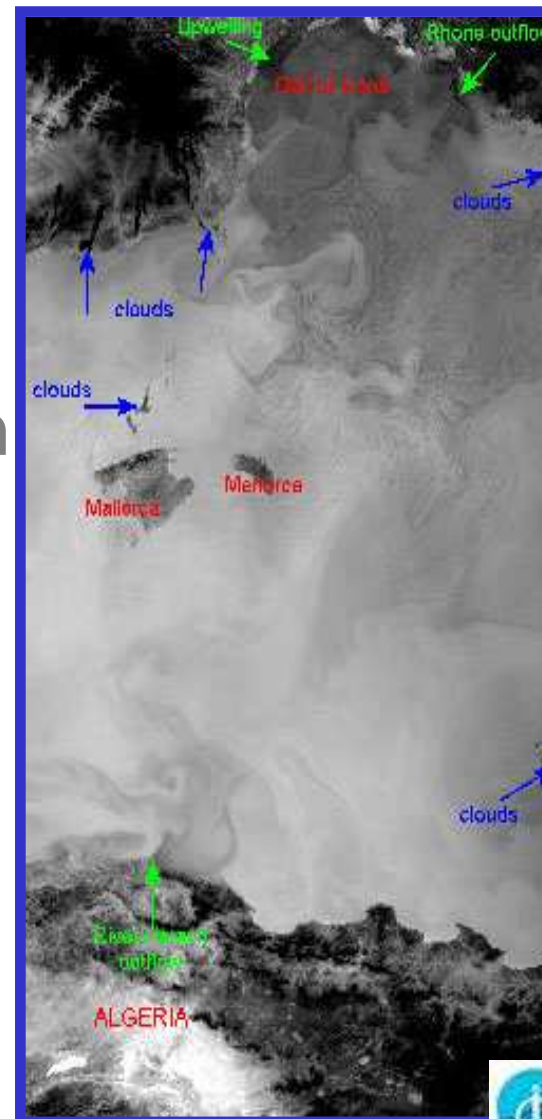
-Web site

Bilko users

Challenges

Conclusions

- Introduction
 - ❖ Aim and objectives
 - ❖ Images used
 - ❖ Content overview
- Background information
- Step-by-step instructions
- Questions to test student understanding
- Model answers for those working alone



Answers

- a) The location of the Algerian coast
- b) Because with altitude higher than Earth's surface, these are more visible. The two islands selected are the two in the area below 13°N. Redisplay
- c) Figure 7 shows the location of the Algerian coast. This image is in a number of water from off-shore, Algerian coast area of clouds less clear further off





The Bilko web site



What is Bilko?

A brief history

Bilko today:

-Software
-Tutorials and lessons
-Web site

Bilko users

Challenges

Conclusions

- Registration
- Downloads
 - ❖ Bilko software
 - ❖ Lessons
 - ❖ Images
 - ❖ Tools
- Resources
 - ❖ Data sources
 - ❖ Further reading

UNESCO-Bilko

Home Software Tutorials and Lessons Workshops and Courses Resources About Bilko F.A.Q. Register

Virtual global faculty for remote sensing

Bilko is a complete system...
...for learning and teaching remote sensing image analysis skills. Current lessons teach the application of remote sensing to oceanography and coastal management, but Bilko routines may be applied to the analysis of any image in an appropriate format, and include a wide range of standard image processing functions.
Supported by UNESCO, Bilko is available to registered users absolutely free!
All you need to download software or lessons is your registered e-mail address.

Bilko 3.3 Latest version October 2009
Click for information and download

Bilko components:
The software: PC-based, easy to use, and surprisingly powerful
Tutorials and mini lessons: A step by step approach to image processing and analysis
Thematic modules and lessons: Remote sensing applied to specific problems
The Bilko network: A thriving, global community of users and lesson producers.

Using Bilko to learn image processing:
The Bilko software is accompanied by a number of lessons that show how to carry out common image processing routines. Others demonstrate different applications of remote sensing.

- **Tutorials** deal with how to use the Bilko software, and teach common image processing techniques.
- **Mini-lessons** are short tutorials, each dealing with a specific, advanced, image processing topic, that can be completed in about an hour.
- **Lessons** generally deal with an application of remote sensing data, and take longer to complete than the mini-lessons - typically 2-3 hours.
- **Modules** are collections of lessons with a common theme. This can be an application area such as Coastal Management or different applications of data from a particular satellite.

Module 7 Coastal Management
Envisat Module
Click here for more information

Last update: 08 May 2007 Contact Site Policy Credits

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Bilko users



What is Bilko?

A brief history

Bilko today:

- Software
- Tutorials and lessons
- Web site

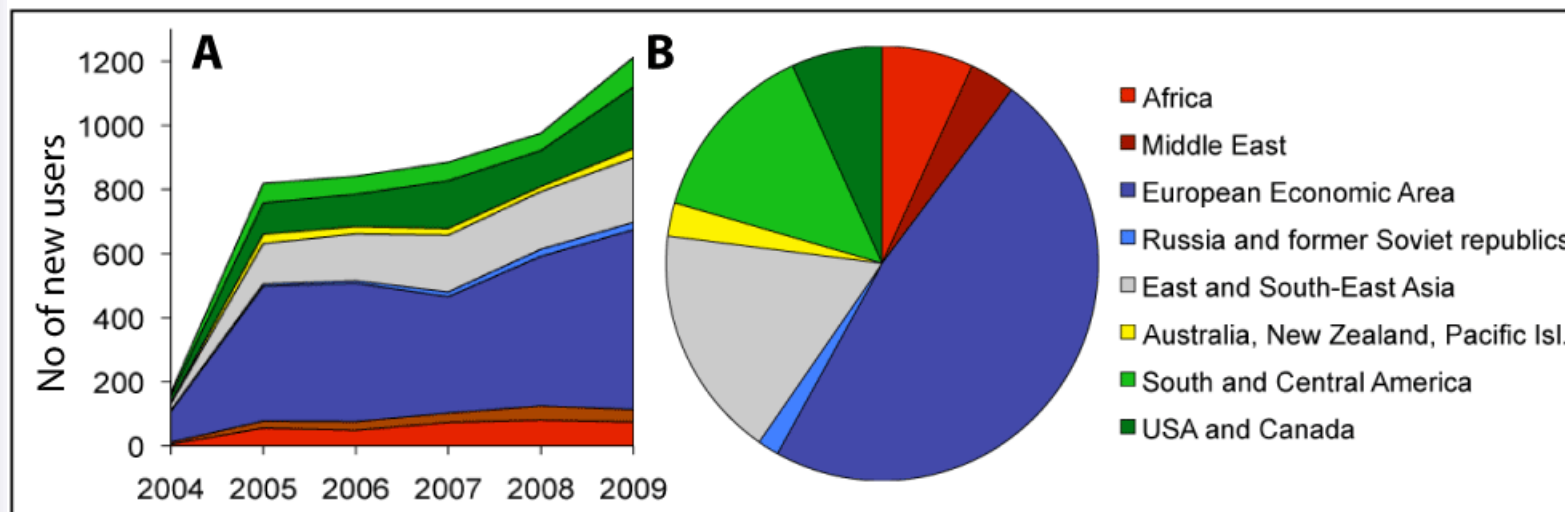
Bilko users

Challenges

Conclusions

➤ Where?

- ❖ Over 5200 registered individual users in over 1300 organisations in 168 countries around the world.
(Figures from 31 March 2010)





Bilko users



What is Bilko?

A brief history

Bilko today:

- Software
- Tutorials and lessons
- Web site

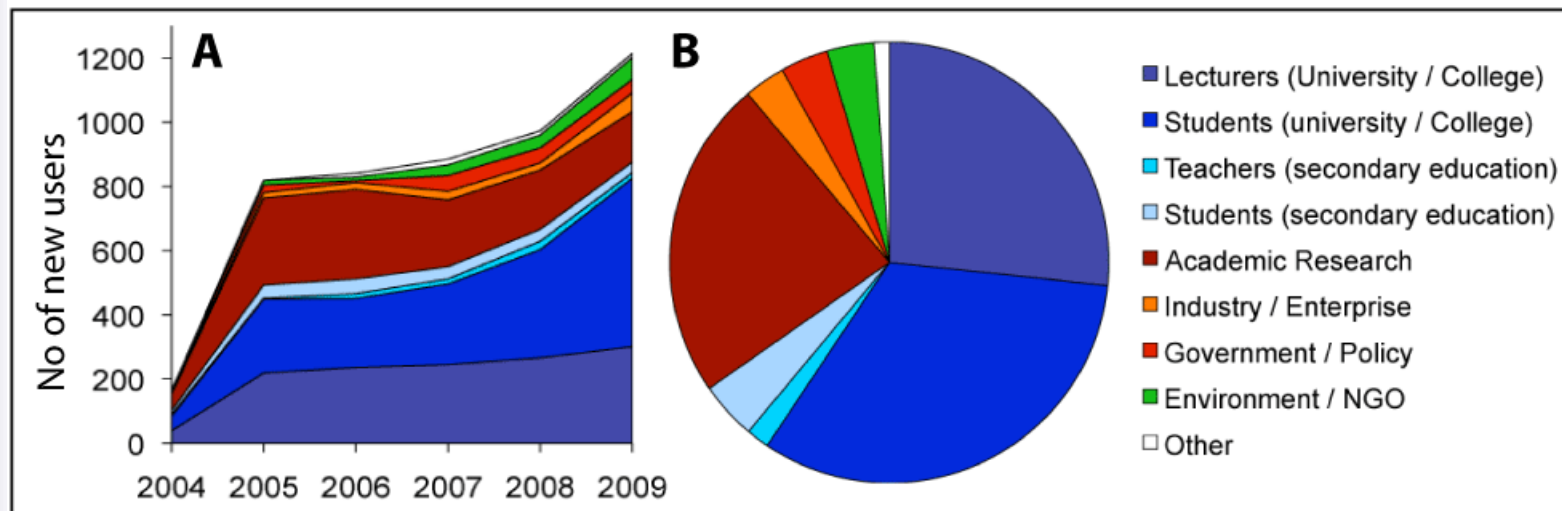
Bilko users

Challenges

Conclusions

➤ Who?

- ❖ Mainly higher education – lecturers and students
- ❖ Nearly ¼ of users in academic research
- ❖ Growing interest from non-academic sectors





Wide use as training tool



What is Bilko?

A brief history

Bilko today:

- Software
- Tutorials and lessons
- Web site

Bilko users

Challenges

Conclusions



MSc students testing a new Bilko lesson



African participants in ESA Tiger workshop



WIOMSA training course in altimetry, 2004

- University courses at BSc and Master level
 - ❖ UK students often help to test new software versions and lessons before wider release
- Advanced training and professional development workshops
 - ❖ 1 – 2 week courses providing training in specific applications
 - ❖ New lessons for some courses
 - ❖ Essential feedback on software and lessons
 - ❖ Help to set priorities for Bilko development





Wide use as training tool in Russian



Ground works, 2007- 09: Coastal zone erosion studying

What is Bilko?

A brief history

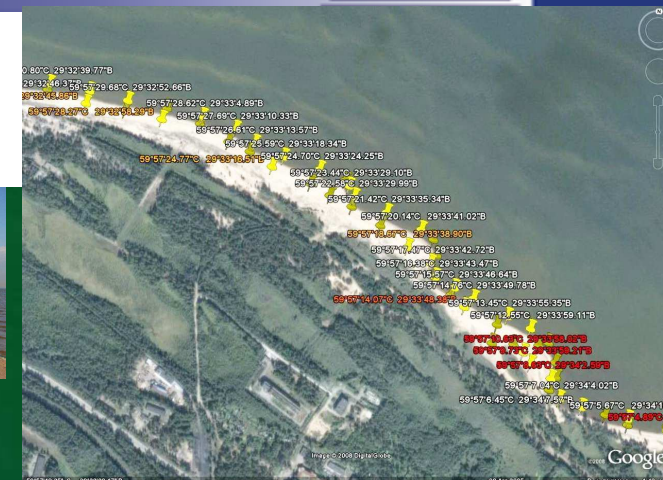
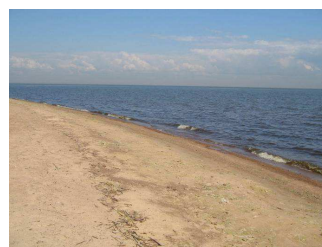
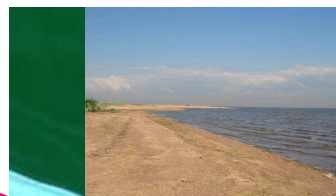
Bilko today:

- Software
- Tutorials and lessons
- Web site

Bilko users

Challenges

Conclusions



Photos Georgy Gogoberidze

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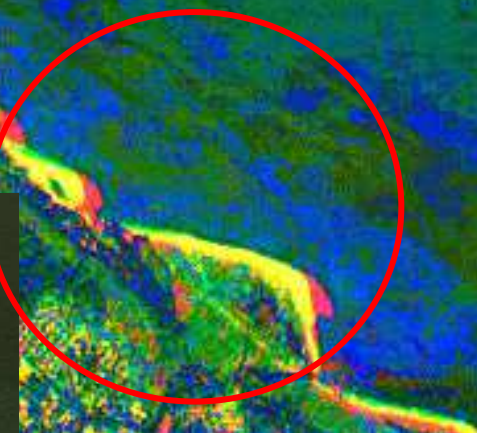
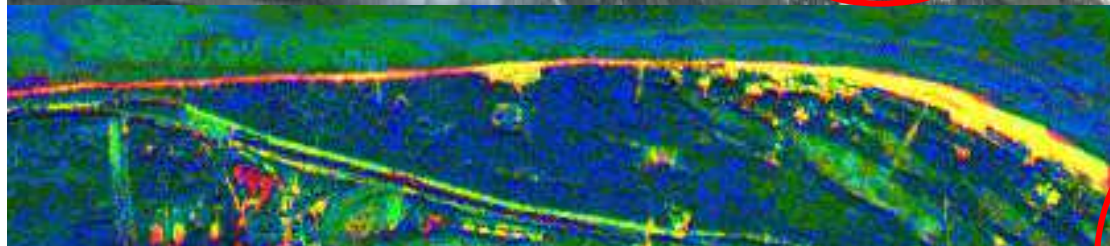
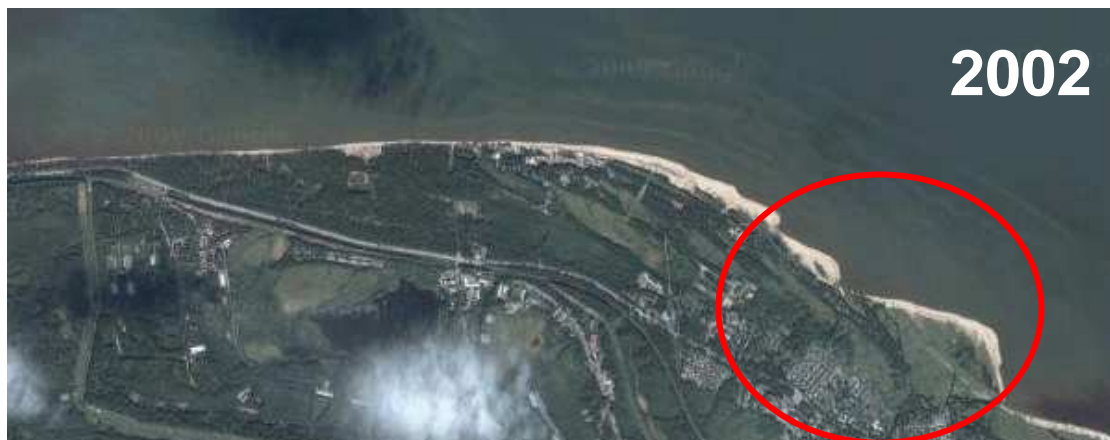


Wide use as training tool in Russian



Results of ground works
at the test sites compared
with remote sensed data:

Coastal line changes,
evolution of sand
accumulative body



What is Bilko?

A brief history

Bilko today:

- Software
- Tutorials and lessons
- Web site

Bilko users

Challenges

Conclusions

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Wide use as training tool in Russian



Concentrations of resuspended materials in the Eastern part of the Gulf of Finland, 12 September 2006, Terra MODIS imagery.



What is Bilko?

A brief history

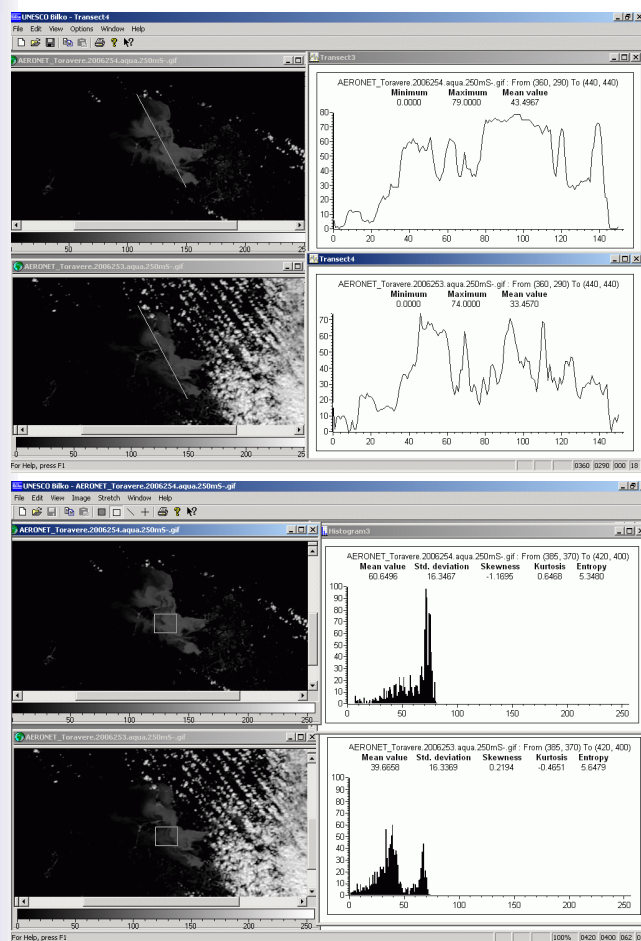
Bilko today:

- Software
- Tutorials and lessons
- Web site

Bilko users

Challenges

Conclusions





European Space Agency Summer School



What is Bilko?

A brief history

Bilko today:

- Software
- Tutorials and lessons
- Web site

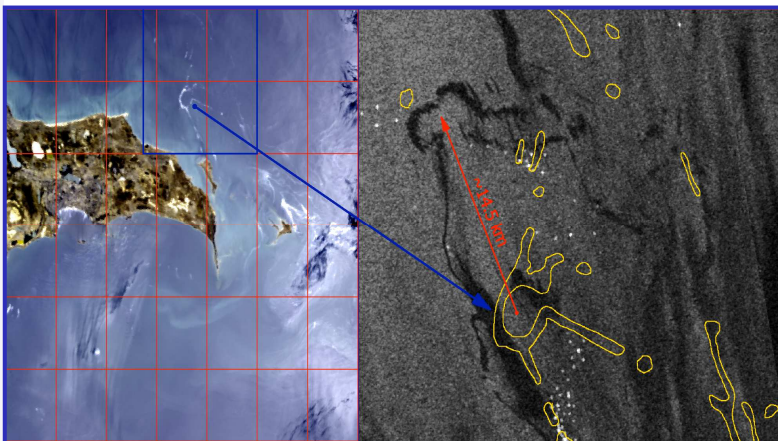
Bilko users

Challenges

Conclusions



~80 PhD students and post-docs at ESA summer school use Bilko for five half day sessions, and provide valuable feedback.



New lesson on **oil spill monitoring** using SAR / optical sensors to be tested in 2010

- 2004, 2006, 2008:
 - ❖ Testing and review of the Bilko Envisat module
 - ❖ Student feedback lead to improvements before distance learning release
- 2010:
 - ❖ ESA staff help with new lesson development
 - Sourcing images
 - Review and testing
 - ❖ Two new lessons:
 - Oil spill monitoring
 - Indian ocean dipole





Zanzibar workshop 2007



What is Bilko?

A brief history

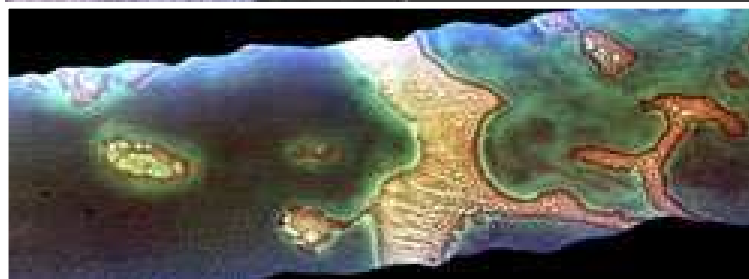
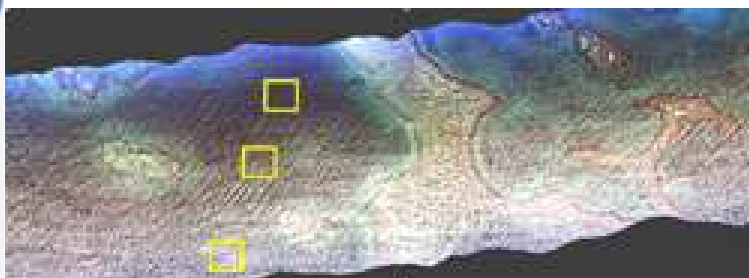
Bilko today:

- Software
- Tutorials and lessons
- Web site

Bilko users

Challenges

Conclusions



Participants of WIOMSA/CRTR workshop on monitoring of coral reefs on a ground-truthing field trip to Chombe Island.

➤ Training:

- ❖ Geometric and water column correction of images,
- ❖ Removal of sun glint (right),
- ❖ Supervised classification of coral reef habitats

➤ Positive feedback:

- ❖ Intuitive nature of Bilko
- ❖ Easy to use supervised classification routine
- ❖ **Potential alternative to costly mainstream RS packages**

➤ Wish list:

- ❖ More classification algorithms
- ❖ Export to GIS





Workshop contributions to Bilko



What is Bilko?

A brief history

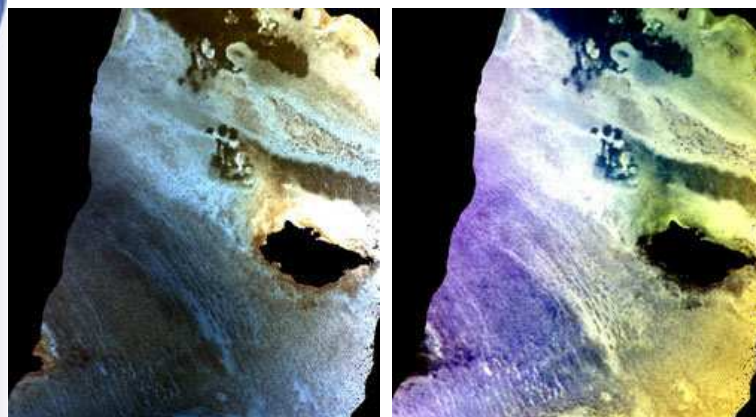
Bilko today:

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- Web site

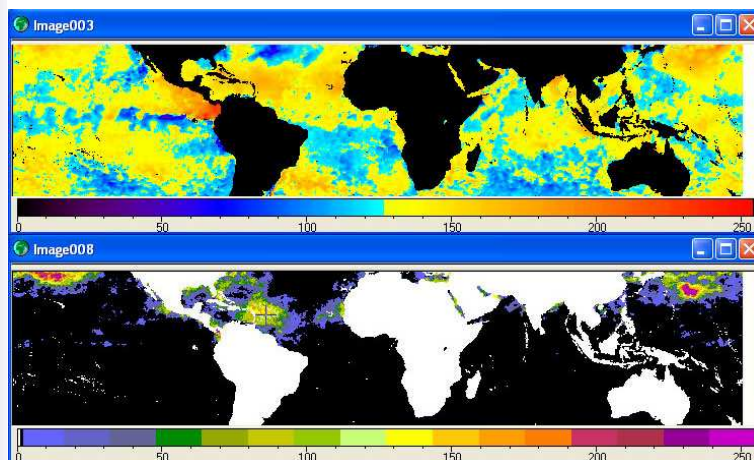
Bilko users

Challenges

Conclusions



Extension and improvement to Module 7:
image correction for variable water depth.



New lesson on coral bleaching developed
after the Zanzibar workshop on coral reefs.

➤ New lesson development

- ❖ Detailed feedback and ideas for improvements to existing modules
- ❖ Access to local expertise and new regional examples for use in new lessons
- ❖ Inspiration for participants to become Bilko authors

➤ Help set priorities for software development

- ❖ Feedback on software utility
- ❖ Ideas for improvements to existing routines
- ❖ Wish list for new facilities





Ocean Colour Africa



What is Bilko?

A brief history

Bilko today:

- Software
- Tutorials and lessons
- Web site

Bilko users

Challenges

Conclusions



➤ Lectures by world experts

- ❖ Principles of ocean optics
- ❖ Algorithms and products
- ❖ Key application areas:
 - Chlorophyll, primary productivity, fisheries
 - Water quality: suspended sediment, algal blooms

➤ Hands-on training:

- ❖ Several software packages:
 - Specialist NASA/ESA ocean colour software: SeaDAS, Beam
 - Bilko for statistical analysis and comparisons with SST
- ❖ Feedback on Bilko: useful **general software** suitable for **non-specialists**





Challenges



What is Bilko?

A brief history

Bilko today:

- Software
- Tutorials and lessons
- Web site

Bilko users

Challenges

Conclusions

➤ Important achievements in the last 25 years

- ❖ Large number of users in research and education
- ❖ Global user base, wide use in courses / workshops
- ❖ **Increasingly used as a non-specialist research tool**

➤ But..

- ❖ Remote sensing and computer technologies are continuously updated, upgraded and improved.
- ❖ **Bilko software and lessons need to keep up with current developments** in order to remain a useful tool.





Challenges: software



What is Bilko?

A brief history

Bilko today:

-Software

-Tutorials and lessons

-Web site

Bilko users

Challenges

Conclusions

➤ Greater processing capacity

- ❖ Larger images: higher spatial resolution, greater accuracy, wider dynamic range, more bands
- ❖ Longer time series, increasing temporal cover

➤ Some changes may be achieved by incremental improvements

- ❖ Support for some of the new data formats
- ❖ New processing routines on user wish lists

➤ But some essential new developments require **major, concentrated effort**

- ❖ Making Bilko **fully** compatible with Window 7
- ❖ 64-bit version of Bilko to increase working memory and obtain better accuracy of statistical tools





Challenges: lesson development



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- Lessons for new data products
- Increase geographical spread of examples
 - ❖ **Local examples** needed for all IOC priority areas
- Possible solution:
 - ❖ **Recruit** local experts as Bilko authors to develop lessons based on case studies from their research,
 - ❖ Requires **support** for new Bilko authors, more effort on student testing and scientific review





Conclusions



What is Bilko?

A brief history

Bilko today:

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Bilko users

Challenges

Conclusions

- Bilko has succeeded in its original aims
 - ❖ Free Bilko software and lessons are widely used
 - ❖ Long track record of supporting workshops and courses
- Recent updates has made Bilko a useful tool
 - ❖ Valuable resource for **training** and education,
 - ❖ Increasingly seen as a **research tool** for professional users that are not primarily remote sensing experts.
 - ❖ Valuable contribution to IOC's remote sensing strategy
- Challenge for the future:
 - ❖ Being seen as a potential alternative to commercial image processing systems **demands a continuous development of Bilko software and tutorials** that may be hard to meet without increased resources





Спасибо за внимание.
Thank you for your attention.
Merci pour votre attention.
Danke für die Aufmerksamkeit.

Есть ли вопросы?
Any Questions?
Vos questions?
Ob es die Fragen gibt?

